STATE OF CALIFORNIA
DEPARTMENT OF NATURAL RESOURCES
RICHARD SACHSE, Director

DIVISION OF MINES
FERRY BUILDING, SAN FRANCISCO

WALTER W. BRADLEY — State Mineralogist

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CALIFORNIA MINERAL PRODUCTION

AND

DIRECTORY OF MINERAL PRODUCERS

FOR 1939

By
HENRY H. SYMONS

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CONTENTS

Page

LETTER OF TRANSMITTAL ---- 7
INTRODUCTION ---- 9

CHAPTER I

SUMMARY OF THE MINERAL INDUSTRY IN CALIFORNIA DURING THE YEAR of 1937 ---- 11
TABULATION OF THE MINERAL PRODUCTION, SHOWING COMPARATIVE AMOUNTS AND VALUES—1936 AND 1937 ---- 12
TABLE SHOWING COMPARATIVE MINERAL PRODUCTION OF THE VARIOUS COUNTIES IN CALIFORNIA FOR 1936 AND 1937 ---- 13
TOTAL PRODUCTION, 1887-1937 ---- 14

CHAPTER II

FUELS (HYDROCARBONS)—
INTRODUCTORY ---- 15
COAL ---- 15
NATURAL GAS ---- 16
PETROLEUM ---- 19

CHAPTER III

METALS—
INTRODUCTORY ---- 32
ALUMINUM ---- 32
ANTIMONY ---- 33
ARSENIC ---- 33
BERYLLIUM ---- 34
BISMUTH ---- 34
CADMIUM ---- 34
CHROMITE ---- 35
COBALT ---- 37
COPPER ---- 37
GOLD ---- 39
IRIDIUM. (*See* Platinum)
IRON ---- 44
LEAD ---- 45
MANGANESE ---- 46
MOLYBDENUM ---- 47
NICKEL ---- 48
OSMIUM. (*See* Platinum.)
PALLADIUM. (*See* Platinum.)
PLATINUM ---- 49
QUICKSILVER ---- 50
SILVER ---- 52
TIN ---- 55
TITANIUM ---- 55
TUNGSTEN ---- 56
VANADIUM ---- 57
ZINC ---- 58

CHAPTER IV

STRUCTURAL MATERIALS—
INTRODUCTORY ---- 59
ASPHALT ---- 60
BITUMINOUS ROCK ---- 60
BRICK AND HOLLOW TILE ---- 61
CEMENT ---- 62
GRANITE ---- 64
LIME ---- 66
MAGNESITE ---- 66
MARBLE ---- 68
ONYX AND TRAVERTINE ---- 69
SANDSTONE ---- 70
SERPENTINE ---- 70
SLATE ---- 71
STONE—MISCELLANEOUS ---- 72
Paving Blocks ---- 73
Grinding-Mill Pebbles ---- 73
Sand and Gravel ---- 74
Crushed Rock ---- 75

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CONTENTS—Continued

CHAPTER V

Page

INDUSTRIAL MATERIALS—

INTRODUCTORY ---- 78
ASBESTOS ---- 79
BARITE ---- 80
BENTONITE (Fuller's Earth) ---- 81
CALCIUM SILICATE ---- 82
CARBON DIOXIDE GAS ---- 83
CLAY—POTTERY ---- 83
DIATOMITE ---- 86
DOLOMITE ---- 87
FELDSPAR ---- 88
FLUORSPAR ---- 89
GARNETS (Abrasive) ---- 89
GEMS ---- 90
GRAPHITE ---- 91
GYPSUM ---- 92
LIMESTONE ---- 94
LITHIA ---- 95
MICA ---- 96
MINERAL PAINT ---- 97
MINERAL WATER ---- 98
PHOSPHATES ---- 99
PUMICE AND VOLCANIC ASH ---- 100
PYRITES ---- 100
SHALE OIL ---- 101
SILICA (Sand and Quartz) ---- 102
SILLIMANITE-ANDALUSITE-CYANITE GROUP ---- 103
SOAPSTONE AND TALC ---- 104
STRONTIUM ---- 106
SULPHUR ---- 107
ZIRCON ---- 108

CHAPTER VI

SALINES—

INTRODUCTORY ---- 109
ALUM MINERALS ---- 109
BORATES ---- 110
BROMINE ---- 112
CALCIUM CHLORIDE ---- 112
IODINE ---- 113
MAGNESIUM SALTS ---- 113
NITRATES ---- 114
POTASH ---- 115
SALT ---- 116
SODA ---- 117

CHAPTER VII

MINERAL PRODUCTION OF CALIFORNIA BY COUNTIES—

INTRODUCTORY ---- 119
ALAMEDA ---- 120
ALPINE ---- 121
AMADOR ---- 121
BUTTE ---- 121
CALAVERAS ---- 122
COLUSA ---- 122
CONTRA COSTA ---- 123
DEL NORTE ---- 123
EL DORADO ---- 123
FRESNO ---- 124
GLENN ---- 124
HUMBOLDT ---- 125
IMPERIAL ---- 125
INYO ---- 125
KERN ---- 126
KINGS ---- 126
LAKE ---- 127
LASSEN ---- 127
LOS ANGELES ---- 128
MADERA ---- 128
MARIN ---- 129
MARIPOSA ---- 129
MENDOCINO ---- 130
MERCED ---- 130
MODOC ---- 130
MONO ---- 131
MONTEREY ---- 131
NAPA ---- 131
NEVADA ---- 132

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CONTENTS—Continued

Page

MINERAL PRODUCTION OF CALIFORNIA BY COUNTIES—(Continued)

ORANGE ---- 132
PLACER ---- 133
PLUMAS ---- 133
RIVERSIDE ---- 134
SACRAMENTO ---- 134
SAN BENITO ---- 135
SAN BERNARDINO ---- 135
SAN DIEGO ---- 136
SAN FRANCISCO ---- 136
SAN JOAQUIN ---- 136
SAN LUIS OBISPO ---- 137
SAN MATEO ---- 137
SANTA BARBARA ---- 138
SANTA CLARA ---- 138
SANTA CRUZ ---- 138
SHASTA ---- 139
SIERRA ---- 139
SISKIYOU ---- 140
SOLANO ---- 140
SONOMA ---- 140
STANISLAUS ---- 141
SUTTER ---- 141
TEHAMA ---- 142
TRINITY ---- 142
TULARE ---- 142
TUOLUMNE ---- 143
VENTURA ---- 143
YOLO ---- 144
YUBA ---- 144

CHAPTER VIII

DIRECTORY OF PRODUCERS OF METALLIC AND NONMETALLIC MINERALS IN CALIFORNIA, 1937—

INTRODUCTORY ---- 145
ALUM (Native) ---- 146
ANTIMONY ---- 146
BARITES ---- 146
BENTONITE (Fuller's Earth) ---- 147
BITUMINOUS ROCK ---- 147
BORATES ---- 148
BROMINE ---- 148
CALCIUM CHLORIDE ---- 149
CALCIUM SILICATE ---- 149
CARBON DIOXIDE GAS ---- 149
CEMENT ---- 150
CHROMITE ---- 150
CLAY ---- 151
COAL ---- 155
COPPER ---- 155
DIATOMITE ---- 156
DOLOMITE ---- 156
FELDSPAR ---- 157
GARNETS ---- 157
GEMS ---- 157
GOLD ---- 158
GRANITE ---- 166
GYPSUM ---- 167
IODINE ---- 168
IRON ---- 168
LEAD ---- 169
LIME AND LIMESTONE ---- 170
LITHIA ---- 171
MAGNESITE ---- 171
MAGNESIUM SALTS ---- 171
MANGANESE ORE ---- 172
MARBLE (including Onyx and Travertine) ---- 172
MINERAL WATER ---- 173
PLATINUM ---- 175
POTASH ---- 176
PUMICE AND VOLCANIC ASH ---- 176
PYRITE ---- 177
QUICKSILVER ---- 177
SALT ---- 179
SANDSTONE ---- 180
SILICA (Sand and Quartz) ---- 181
SILLIMANITE-ANDALUSITE-CYANITE GROUP ---- 181
SILVER ---- 182
SLATE ---- 184
SOAPSTONE AND TALC ---- 184

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CONTENTS—Continued

Page

DIRECTORY OF PRODUCERS OF METALLIC AND NONMETALLIC MINERALS IN CALIFORNIA, 1937—(Continued)

SODA ---- 185
STONE, MISCELLANEOUS ---- 186
STRONTIUM ---- 194
SULPHUR ---- 194
TITANIUM ---- 194
TUNGSTEN ---- 195
SMELTERS, CUSTOM MILLS, ORE AND METAL BUYERS ---- 196

APPENDIX

PUBLIC RESOURCES CODE ---- 197
DIVISION I—DEPARTMENT OF NATURAL RESOURCES ---- 198
DIVISION II—MINES AND MINING ---- 199
INDEX ---- 217

ILLUSTRATIONS

Playa Del Rey Oil Field, Los Angeles County ---- 21
600 ton sand leaching plant, Santa Fe Mine, San Bernardino County ---- 39
Sulphur Bank Quicksilver Mine (Parrot Pet.), Lake County; Clear Lake in the background ---- 51
Pine Creek Tungsten Mine, Pine Creek, Inyo County ---- 56
Riverside Portland Cement Co. plant, Crestmore, Riverside County ---- 63
Pacific Portland Cement Co., gypsum plant at Plaster City, Imperial County ---- 93
Pacific Coast Borax Mine at Kramer, Kern County ---- 111
Plant of American Potash and Chemical Co. at Trona on Searles Lake, San Bernardino County ---- 115
Chart showing location by counties California commercial minerals ---- 118

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LETTER OF TRANSMITTAL

September, 1940

To His Excellency, THE HONORABLE CULBERT L. OLSON,
Governor of the State of California.

SIR: I have the honor to herewith transmit Bulletin No. 119 of the Division of Mines, of the Department of Natural Resources, being the annual report of the statistics of the mineral production of California.

The remarkable variety, total values, and wide distribution of many of our minerals revealed herein show California's importance as a producer of commercial minerals among the states of the Union.

Respectfully submitted.

RICHARD SACHSE,
Director, Department of Natural Resources.

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INTRODUCTION

It is the endeavor of the staff of the State Division of Mines (formerly State Mining Bureau), in these annual reports of the mineral industries of California, to so compile the statistics of production that they will be of actual use to producers and to those interested in the utilization of the mineral products of our State, while at the same time keeping the individual's data confidential. In addition to the mere figures of output, we have included descriptions of the uses and characteristics of many of the materials, as well as a brief mention of their occurrences.

The compilation of accurate and dependable figures is an extremely difficult undertaking, and the State Mineralogist takes the opportunity of here expressing his appreciation of the cooperation of the producers in making this work possible. A fuller appreciation of the value of early responses to the requests sent out in January will result in earlier completion of the manuscript. Statistics lose much of their value if their publication is unnecessarily delayed.

Some of the data relative to properties and uses of many of the minerals herein described are repeated from preceding reports, as it is intended that this annual statistical bulletin shall be somewhat of a compendium of information on California's commercial minerals and their utilization.

WALTER W. BRADLEY,
State Mineralogist.

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MINERAL INDUSTRY, CALIFORNIA, 1939

DATA COMPILED FROM DIRECT RETURNS FROM PRODUCERS IN ANSWER TO INQUIRIES SENT OUT BY THE CALIFORNIA STATE DIVISION OF MINES, FERRY BUILDING, SAN FRANCISCO, CALIFORNIA

CHAPTER ONE

The total value for the mineral output for California for the year 1939 was $352,462,564, being a decrease of $27,982,412 from the total of 1938 which was $380,444,976, the decrease being due to petroleum. There were sixty-two different mineral substances, exclusive of a segregation of various stones grouped under gems; and all fifty-eight counties of the State contributed to the list.

As revealed by the following, the salient features of 1939 compared with the previous year were: The metal and industrial-materials groups showed increases in total value, while fuels, structural materials, and salines showed a decline. Of the year's mineral output gold showed the greatest increase in value, followed in turn by copper, brick and hollow building-tile, tungsten ore, quicksilver, lime, magnesite, cement, limestone, borates, talc and soapstone, silica, and salt; while those showing decreases in amount and value were petroleum, potash, miscellaneous stone, and mineral water. Returned to the commercial list after several years absence were antimony, molybdenum, titanium ores, and strontium.

Of the fuels, petroleum showed a decrease in value of $31,995,487 and a decrease in amount from 249,395,763 barrels to 224,253,110 barrels of crude. There were no marked changes in prices of crude from June, 1936, until May, 1940. Natural gas showed an increase in amount and a decrease in value from 332,358,439 M. cu. ft. worth $22,310,755 to 340,754,804 M. cu. ft. valued at $21,551,646.

Of the metals all materials under this grouping showed an increased value of output with the exception of platinum and iron ore. The gold production increased from 1,311,129 to 1,435,264 fine ounces, and in value from $45,889,515 to $50,234,240; copper from 1,613,491 lbs. worth $158,122, to 8,390,215 lbs. worth $872,582; tungsten from 46,107 units worth $786,860 to 74,110 units worth $1,153,735; quicksilver from 12,171 flasks worth $846,497 to 11,201 flasks worth $1,102,563; and silver from 2,590,804 fine ozs. worth $1,674,863 to 2,599,139 fine ozs. worth $1,764,264. The 1939 gold value was the greatest since 1856 while that of chromite, antimony, and tungsten ore was the greatest since 1919; that of molybdenum ore being greater than the total of all previous output.

Of the structural materials; lime increased in value and amount from 70,578 tons worth $683,403 to 87,288 tons worth $849,122 and its largest annual yield; cement from 10,561,037 barrels worth $15,502,574 to 10,984,033 barrels worth $15,616,219; increased values were also registered by brick and hollow building-tile; granite; marble and sandstone. Miscellaneous stone declined in value from $11,734,038 to

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$10,316,787; also decreased values were shown by bituminous rock and slate.

In the industrial group the total value increased from $5,027,093 to $5,622,449, with gypsum, limestone, pumice and volcanic ash, silica (quartz and glass sand), and talc and soapstone reaching all-time highs in annual production. The total value of the saline group decreased from $14,279,949 to $13,178,499, although borax, iodine, salt, and soda registered increases in total value for the year, with soda exceeding all previous annual output.

By Substances.

The following table shows the comparative yield of mineral substances of California for 1938 and 1939, as compiled from the returns received at the State Division of Mines, San Francisco, in answer to inquiry sent to producers:

Substance	1938		1939		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Antimony ore			150 tons	$4,552	$4,552+
Bentonite	9,374 tons	$113,164	11,284 tons	138,854	25,690+
Bituminous rock	*	*	16,546 tons	63,612	* +
Borates	276,144 tons	5,014,237	244,819 tons	5,110,807	96,570+
Brick and hollow building tile		2,594,546		3,063,660	469,114+
Cement	10,561,037 bbls.	15,502,574	10,984,033 bbls.	15,616,219	113,645+
Chromite	*	*	3,936 tons	52,673	* +
Clay (pottery)	304,564 tons	582,608	305,519 tons	611,599	28,991+
Coal	275 tons	1,650	*	*	* +
Copper	1,613,491 lbs.	158,122	8,390,215 lbs.	872,582	714,460+
Dolomite	*	*	17,791 tons	40,391	* +
Feldspar	*	*	2,076	12,510	* +
Gems		4,575		2,500	2,075—
Gold	1,311,129 fine ozs.	45,889,515	1,435,264 fine ozs.	50,234,240	4,344,725+
Granite		131,386		145,194	13,808+
Gypsum	161,996 tons	327,821	219,671 tons	437,343	109,522+
Iron ore	*	*	16,990 tons	77,788	* +
Lead	1,003,096 lbs.	46,142	1,061,294 lbs.	49,880	3,738+
Lime	70,578 tons	683,403	87,288 tons	849,122	165,719+
Limestone	302,655 tons	729,149	316,029 tons	838,235	109,086+
Magnesium salts	24,176 tons	469,636	3,894 tons	382,457	87,179—
Marble[a]		6,015		14,822	8,807+
Mineral water	26,900,959 gals.	853,998	16,678,741 gals.	735,988	118,010—
Natural gas	332,358,439 M cu.ft.	22,310,755	340,754,804 M cu.ft.	21,551,646	759,109—
Petroleum	249,395,763 bbls.	258,354,343	224,253,110 bbls.	226,358,856	31,995,487—
Platinum group	1,069 fine ozs.	35,150	896 fine ozs.	32,135	3,015—
Pumice and volcanic ash	18,783 tons	105,207	40,109 tons	159,951	54,744+
Quicksilver	12,171 flasks	846,497	11,201 flasks	1,102,563	256,066+
Salt	395,746 tons	1,099,737	417,956 tons	1,174,386	74,649+
Sandstone		9,384		12,494	3,110+
Silica (sand and quartz)	63,167 tons	278,676	86,229 tons	349,074	70,398+
Silver	2,590,804 fine ozs.	1,674,863	2,599,139 fine ozs.	1,764,264	89,401+
Slate	6,871 tons	30,281	5,777 tons	28,327	1,954—
Soapstone and talc	28,346 tons	290,810	31,820 tons	372,078	81,268+
Soda	178,105 tons	2,023,610	200,049 tons	2,055,608	31,998+
Stone, miscellaneous[b]		11,734,038		10,316,787	1,417,251—
Sulphur	*	*	4,811 tons	73,741	* +
Tungsten ore	768 tons	786,860	1,235 tons	1,153,735	366,875+
Zinc	17,554 lbs.	843	16,390 lbs.	852	9+
Unapportioned		[c]7,755,381		[d]6,601,039	1,154,342—
Total values		$380,444,976		$352,462,564	
Net decrease					$27,982,412

* Included under 'Unapportioned.'

[a] Includes onyx and travertine.

[b] Includes macadam, crushed rock, ballast, rubble, riprap, sand and gravel.

[c] Includes alum, barite, bituminous rock, bromine, carbon dioxide, calcium chloride, calcium silicate, chromite, diatomite, dolomite, feldspar, garnets, iodine, iron ore, lithia, magnesite, mica, potash, pyrite, sillimanite group, serpentine, sulphur, paving blocks, tube-mill pebbles.

[d] Includes barite, bromine, calcium chloride, calcium silicate, carbon dioxide, coal, diatomite, garnets, iodine, lithia, magnesite, manganese ore, molybdenum, potash, paving blocks, pyrite, sillimanite group, strontium, titanium, tube-mill pebbles.

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By Counties.

The following table shows the comparative value of the mineral production of the various counties in the State for the years 1938 and 1939:

County	1938	1939
Alameda	$2,531,600	$2,778,587
Alpine	11,123	7,328
Amador	3,880,444	4,314,573
Butte	2,177,265	2,217,721
Calaveras	4,357,938	5,392,940
Colusa	2,884	20,149
Contra Costa	2,116,285	2,206,131
Del Norte	15,997	13,101
El Dorado	2,207,099	3,277,679
Fresno	30,159,518	21,275,300
Glenn	60,138	54,591
Humboldt	97,181	133,150
Imperial	604,227	822,271
Inyo	1,583,893	1,614,597
Kern	71,528,574	62,105,687
Kings	15,410,875	16,647,443
Lake	281,098	451,575
Lassen	59,546	46,277
Los Angeles	125,027,054	113,577,646
Madera	29,916	119,831
Marin	189,843	133,756
Mariposa	1,588,861	1,755,776
Mendocino	46,378	47,691
Merced	2,867,501	2,611,896
Modoc	5,896	23,658
Mono	349,516	513,357
Monterey	187,144	229,058
Napa	637,963	714,895
Nevada	11,667,896	11,468,556
Orange	21,601,082	18,850,782
Placer	2,020,042	1,710,738
Plumas	878,277	2,265,956
Riverside	3,306,793	3,187,902
Sacramento	5,467,487	5,875,597
San Benito	527,192	547,093
San Bernardino	16,752,866	14,664,598
San Diego	535,722	633,147
San Francisco	33,607	52,669
San Joaquin	781,907	1,104,898
San Luis Obispo	242,500	174,124
San Mateo	2,026,217	2,418,895
Santa Barbara	10,683,722	8,911,006
Santa Clara	624,463	716,346
Santa Cruz	1,907,188	3,140,742
Shasta	1,791,727	2,058,547
Sierra	905,237	871,212
Siskiyou	1,510,815	1,847,687
Solano	431,677	640,024
Sonoma	232,495	329,069
Stanislaus	845,523	1,069,730
Sutter	28,973	68,733
Tehama	81,431	82,094
Trinity	1,493,132	1,514,951
Tulare	273,199	452,547
Tuolumne	1,130,263	669,844
Ventura	21,966,416	20,773,214
Yolo	48,232	63,143
Yuba	2,633,138	3,192,056
Total values	$380,444,976	$352,462,564

Total Mineral Production of California, by Years, Since 1887.

The following tabulation gives the total value of mineral production of California by years since 1887, in which year compilation of such data by the State Mining Bureau (now Division of Mines) began. At the side of these figures have been placed the values of the most important metal and nonmetal items—gold and petroleum.

In the same period copper made an important growth beginning with 1897 following the entry of the Shasta County mines, and later

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Plumas County. Cement increased rapidly from 1902, while crushed rock, sand and gravel as a group paralleled the cement increase. Quicksilver has been up and down. Mineral water and salt have always been important items, but the values fluctuate. Borax has increased materially since 1896. War-time increases, 1915–1918, were shown by chromite, copper, lead, magnesite, manganese, silver, tungsten and zinc. Most of these have since declined, though silver, structural materials and copper increased in 1920–1924, also lead and magnesite in 1923; lead and zinc in 1925; zinc in 1926, with silver declining; an increase in quicksilver in 1927–1928, with declines in other metals and by petroleum. Natural gas showed a steady increase from 1907, and in 1928–1933 its value was second only to petroleum.

In 1929 the annual output of gold was the smallest since its discovery. From 1929 to 1939 there was a rapid increase in gold production, due in part to the raise in its price per ounce.

Total Mineral Production of California, by Years, Since 1887

Year	Total value of all minerals	Gold, value	Petroleum, value
1887	$19,785,868	$13,588,614	$1,357,144
1888	19,469,320	12,750,000	1,380,666
1889	16,681,731	11,212,913	368,048
1890	18,039,666	12,309,793	384,200
1891	18,872,413	12,728,869	401,264
1892	18,300,168	12,571,900	561,333
1893	18,811,261	12,422,811	608,092
1894	20,203,294	13,923,281	1,064,521
1895	22,844,663	15,334,317	1,000,235
1896	24,291,398	17,181,562	1,180,793
1897	25,142,441	15,871,401	1,918,269
1898	27,289,079	15,906,478	2,376,420
1899	29,313,460	15,336,031	2,660,793
1900	32,622,945	15,863,355	4,152,928
1901	34,355,981	16,989,044	2,961,102
1902	35,069,105	16,910,320	4,692,189
1903	37,759,040	16,471,264	7,313,271
1904	43,778,348	19,109,600	8,317,809
1905	43,069,227	19,197,043	9,007,820
1906	46,776,085	18,732,452	9,238,020
1907	55,697,949	16,727,928	16,783,943
1908	66,363,198	18,761,559	26,566,181
1909	82,972,209	20,237,870	32,398,187
1910	88,419,079	19,715,440	37,689,542
1911	87,497,879	19,738,908	40,552,088
1912	88,972,385	19,713,478	41,868,344
1913	98,644,639	20,406,958	48,578,014
1914	93,314,773	20,653,496	47,487,109
1915	96,663,369	22,442,296	43,503,837
1916	127,901,610	21,410,741	57,421,334
1917	161,202,962	20,087,504	86,976,209
1918	199,753,837	16,529,162	127,459,221
1919	195,830,002	16,695,955	142,610,563
1920	242,099,667	14,311,043	178,394,937
1921	268,157,472	15,704,822	203,138,225
1922	245,183,826	14,670,346	173,381,265
1923	344,024,678	13,379,013	242,731,309
1924	374,620,789	13,150,175	274,652,874
1925	434,519,660	13,065,330	330,609,829
1926	450,330,856	11,923,481	345,546,677
1927	366,781,394	11,671,018	260,735,498
1928	332,224,233	10,785,315	229,998,680
1929	432,248,228	8,526,703	321,366,863
1930	365,604,695	9,451,162	271,699,046
1931	215,964,420	10,814,162	141,835,723
1932	199,196,493	11,765,726	142,890,247
1933	206,489,058	15,683,075	143,063,972
1934	237,374,709	25,131,284	159,529,671
1935	263,404,317	31,165,050	179,335,311
1936	327,804,268	37,710,470	211,667,185
1937	361,515,951	41,110,230	237,845,872
1938	380,444,976	45,889,515	258,345,343
1939	352,462,564	50,234,240	226,358,856
Totals	$8,396,761,638	$963,673,503	$5,343,966,872

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CHAPTER TWO

FUELS

Among the most important mineral products of California are its fuels. This subdivision includes coal, natural gas, and petroleum, the combined values of which make up practically 70 per cent of the State's entire mineral output for the year 1939.

There are deposits of peat known in several localities in California, small amounts of which are used as a fertilizer, and in stock-food preparations, but none has yet been recorded as utilized for fuel.

Comparison of values during 1938 and 1939 is shown in the following table:

Substance	1938		1939		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Coal	275 tons	$1,650	*	*	*
Natural gas	332,358,439 Mcu. ft.	22,310,755	340,754,804 M cu. ft.	$21,551,646	+ 759,109—
Petroleum	249,395,763 bbls.	258,354,343	224,253,110 gals.	226,358,856	31,995,487—
Total value		$280,666,748		$247,910,502	
Net decrease					32,754,596

* Included under unapportioned.

COAL

Bibliography: State Mineralogist Reports VII, XII-XV (inc.), XVII, XIX-XXVIII (inc.), XXVI, XXXI, XXXV. U. S. Geol. Surv., Bulletins 285, 316, 431, 471, 581; Ann. Rept. 22, Pc. III.

The coal production in California during 1939 is concealed under the 'Unapportioned' item so as not to reveal the output of a single property in Contra Costa County. The material mined 1938 came from a single property each, in Amador, San Benito, and Trinity counties. This coal was consumed by the local market and also used on the property for camp purposes, power and forge, to carry on regular operations and development work.

Total Coal Production of California.

The very considerable output of coal in the years previous to 1883 was almost entirely from the Mount Diablo district, Contra Costa County. Later the Tesla mine in Corral Hollow, Alameda County, was an important producer for a few years. Stone Canyon, Monterey County, was also an important producer for a short time, and there has been some coal shipped from properties in Amador, Fresno, Orange, Riverside, Siskiyou and Trinity counties. The following tabulation gives the annual tonnages and values, according to available records:

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Coal Output and Value, by Years

Year	Tons	Value	Year	Tons	Value
1861	6,620	$38,065	1901	150,724	$401,772
1862	23,400	134,550	1902	88,460	248,622
1863	43,200	248,400	1903	93,026	265,383
1864	50,700	291,525	1904	79,062	376,494
1865	60,530	348,048	1905	46,500	144,500
1866	84,020	483,115	1906	24,850	61,600
1867	124,690	716,968	1907	23,734	55,849
1868	143,676	826,137	1908	18,496	55,503
1869	157,234	904,096	1909	49,389	216,913
1870	141,890	815,868	1910	11,033	23,484
1871	152,493	876,835	1911	11,047	18,297
1872	190,859	1,097,439	1912	14,484	39,092
1873	186,611	1,073,013	1913	25,198	85,809
1874	215,352	1,238,274	1914	11,859	28,806
1875	166,638	958,169	1915	10,299	26,662
1876	128,049	736,282	1916	4,037	7,030
1877	107,789	619,787	1917	3,527	7,691
1878	134,237	771,863	1918	6,343	16,149
1879	147,879	850,304	1919	2,983	8,203
1880	236,950	1,362,463	1920	2,078	5,450
1881	140,000	805,000	1921	12,467	63,578
1882	112,592	647,404	1922	27,020	135,100
1883	76,162	380,810	1923	1,010	5,090
1884	77,485	309,950	1924	1,425	8,800
1885	71,615	286,460	1925	730	3,880
1886	100,000	300,000	1926	1,100	5,000
1887	50,000	150,000	1927	200	1,100
1888	95,000	380,000	1928	782	4,542
1889	121,280	288,232	1929	450	2,476
1890	110,711	283,019	1930	10,885	59,858
1891	93,301	204,902	1931	12,551	77,607
1892	85,178	209,711	1932	9,508	36,468
1893	72,603	167,555	1933	2,612	11,367
1894	59,887	139,862	1934	13,549	52,720
1895	79,858	193,790	1935	8,049	32,745
1896	70,649	161,335	1936	370	1,815
1897	87,449	196,255	1937	269	2,933
1898	143,045	337,475	1938	275	1,650
1899	160,941	420,109	1939	*	*
1900	176,956	535,531	Totals	5,267,910	$23,388,639

The tonnages in the above table for the years 1861–1866 (incl.) are taken from the U. S. Geological Survey, "Mineral Resources of the U. S., 1910," p. 107. The values assigned for the years previous to 1883 are those given by W. A. Goodyear (Mineral Res., 1882, pp. 93–94), being an average of $5.75 per ton. From 1887 to date the figures are those of the California State Mining Bureau.

* Annual details concealed under 'Unapportioned.'

NATURAL GAS

Bibliography: State Mineralogist Reports VII, X, XII, XIII, XIV, XXIX, XXXV. Bulletins 3, 16, 19, 69, 73, 89. Monthly Summary Oil and Gas Supervisor, Dec., 1919; Aug., 1922; Mar., 1923; Mar. and Apr., 1926.

Statistics on the production of natural gas in California are in a considerable degree difficult to arrive at, as much of it that is utilized directly at the wells for heating, lighting, and driving gas engines is not measured. Hence, it is necessary to approximate the output of many of the operators in the oil fields, estimated on the number of lights, and on the number and horsepower of gas engines and steam boilers thus operated. The figures here given are for gas utilized locally and also that sold for distribution to consumers; and we consider are not overestimated, particularly in the seven oil-producing counties. It must be remembered that some of our important oil fields are removed many miles from the site of any other industry, and that the gathering of small amounts of gas and transporting it for any considerable distance may not always be profitable, nor is it often possible to have pipe-line

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facilities available to handle the gas accompanying the early gas production in newly developed fields. Wherever feasible, casing-head gas is used in driving gas engines for pumping and drilling, and in firing the boilers of steam-driven plants.

Actual Production of Natural Gas—How Disposed of in California—1939

County	Production, M cubic feet	Stored, M cubic feet	Unconserved wasted, M cubic feet	Utilized, M cubic feet
Fresno	55,161,057		675,972	54,485,085
Kern	81,940,848	4,723,171	3,266,845	73,950,832
Kings	46,942,751	236,873	651,278	46,054,600
Los Angeles	106,091,599	167,333	22,245,800	83,677,966
Orange	18,395,756	21,779	928,599	17,445,378
San Joaquin	10,440,016		7,179	10,432,837
Santa Barbara	5,022,198		427,266	4,594,932
Solano	6,664,195		55,413	6,608,782
Ventura	43,425,728	861,345	1,465,965	41,098,418
Other counties	2,405,974			2,405,974
Totals	376,490,122	6,011,001	29,724,317	340,754,804

Production and Value.

There is a rather wide variation in prices quoted for natural gas because a considerable part is used directly in the field for driving gas engines and firing boilers, and is therefore not measured nor sold. Such companies as have placed a valuation on the gas that was thus used in 1939 gave from 1.5¢ to 45¢ per 1000 cu. ft. at the well. From the totals shown in the tabulation following herein, the average value for all fields in 1939 works out at approximately 6.32¢ per M cu. ft. Approximately 7000 cu. ft. of gas is equal to one barrel of oil in heating value, and is so accounted for by many operators. In driving gas engines, about 4000 cu. ft. per 24 hr. are consumed by a 25-h.p. engine, and 63,700 cu. ft. per day for heating a 70-h.p. steam boiler, which figures have been utilized in compiling this report, in those cases where gas was not metered.

Utilized Production of Natural Gas in California, 1939

County	M cubic feet	Value
Fresno	54,485,085	$2,799,981
Kern	73,950,832	5,191,065
Kings	46,054,600	2,526,102
Los Angeles	83,677,966	5,877,085
Orange	17,445,378	1,185,021
San Joaquin	10,432,837	834,694
Santa Barbara	4,594,932	307,732
Solano	6,608,782	604,868
Ventura	41,098,418	2,038,936
Butte, Humboldt, Lake, Mendocino, Monterey, Sacramento, Sutter, Tulare, Yolo*	2,405,974	186,162
Totals	340,754,804	$21,551,646

* Combined to conceal the output of individual operators in each.

The above showed an increase in total amount with a decrease in value as compared with the figures of the previous year, which were 332,358,439 M cu. ft. worth $22,310,755. Los Angeles County led all others in the yield of natural gas during 1939, followed in turn by Kern, Fresno, Kings, and Ventura counties. Increased outputs were

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reported by Kern, Kings, Los Angeles, San Joaquin, Solano, and Sutter counties; while a decrease was shown by all other producing counties.

Natural Gas Production in California Since 1888.

The production of natural gas in California by years since 1888 is given in the following table. The first economic use of natural gas in California was from the famous courthouse well at Stockton, bored in 1854–1858. Beginning about 1883 and for several succeeding years, a number of gas wells were brought in around Stockton, and later at Sacramento. Natural gas was known in a number of other localities, and occasionally utilized in a small way, notably at Kelseyville in Lake County, and in Humboldt County near Petrolia and Eureka, but there are no available authentic records of amounts or values previous to the year 1888. The most important developments in the commercial production of natural gas have been coincident with developments in the oil fields, by utilizing the casing-head gas as well as that from dry-gas wells.

Natural Gas Production in California Since 1888

Year	M cubic feet	Value	Year	M cubic feet	Value
1888	[a]12,000	$10,000	1914	16,529,963	$1,049,470
1889	[a]14,500	12,680	1915	21,992,892	1,706,480
1890	[a]41,250	33,000	1916	28,134,365	2,871,751
1891	[a]39,000	30,000	1917	44,343,020	2,964,922
1892	[a]75,000	55,000	1918	46,373,052	3,289,524
1893	[a]84,000	68,500	1919	52,173,503	4,041,217
1894	[a][b]85,000	75,000	1920	58,567,772	3,898,286
1895	[a][b]110,000	100,000	1921	67,043,797	4,704,678
1896	[a][b]131,000	110,157	1922	103,628,027	6,990,030
1897	[a]71,300	62,657	1923	240,405,397	15,661,433
1898	[a]111,165	74,424	1924	209,021,596	15,153,140
1899	115,110	95,000	1925	194,719,924	15,890,082
1900	40,566	34,578	1926	214,549,477	19,465,347
1901	120,800	92,034	1927	224,686,940	20,447,294
1902	120,968	99,443	1928	260,887,116	22,260,947
1903	120,134	75,237	1929	400,129,201	29,675,546
1904	144,437	91,035	1930	315,513,952	24,559,840
1905	148,345	102,479	1931	344,959,920	16,690,695
1906	168,175	109,489	1932	284,168,872	16,272,061
1907	169,991	114,759	1933	271,743,544	15,403,514
1908	842,883	474,584	1934	263,207,517	14,408,761
1909	1,148,467	616,932	1935	302,447,193	17,680,661
1910	10,579,933	1,676,367	1936	298,922,708	18,585,970
1911	[a]5,000,000	491,859	1937	323,883,714	19,859,865
1912	[a]12,600,000	940,076	1938	332,358,439	22,310,755
1913	14,210,836	1,053,292	1939	340,754,804	21,551,646
			Totals	5,308,351,565	$364,092,527

[a] Quantity, in part, estimated, where values only were reported.
[b] Tabulations published previously to 1933 included values of CO_2, now shown under "Industrial Materials."

Gasoline from Natural Gas.

More or less gas usually accompanies the petroleum in the old fields, and such gas carries varying amounts of gasoline. A total of 91 plants were in operation in 1939 recovering gasoline by compression or absorption from this 'casing-head' gas. After the gasoline is extracted the remaining 'dry gas' so far as practicable is taken into pipe lines, by which it is distributed to consumers, both domestic and commercial.

A total of 580,655,012 gallons of natural-gas gasoline valued at $32,370,041 was reported from all fields in California by 91 plants

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during 1939, as compared with 576,673,643 gallons worth $34,150,247 from 95 plants in 1938. In 1939 there was also a total of 33,953,424 gallons of liquefied petroleum gas produced for chemical manufacturing, industrial, and domestic fuel. The 1939 output was as follows:

County	No. plants	Gallons	Value
Fresno	1	60,232,811	$3,450,939
Kern	20	60,910,320	3,418,247
Kings	8	2,526,102	5,182,575
Los Angeles	33	239,592,323	13,546,432
Orange	12	57,567,588	2,476,405
Santa Barbara	7	12,302,063	703,187
Ventura	10	60,224,411	3,196,256
Totals	91	580,655,012	$32,370,041

The usual recoveries of gasoline from natural gas vary from ½ gal. to 3 gal. per 1000 cu. ft. of gas handled, the average being about 1 gal. per 1000 cu. ft. The U. S. Bureau of Mines Report by Knudsen [1] gives the average recovery for 1939 as 1.571 gallons per 1000 cu. ft. of gas treated. His figures show the following production by methods:

	M cubic feet natural gas treated	Gallons of gasoline recovered	Recovery gallons per M cu. ft.
Oil absorption	386,138,774	606,631,439	1.571

PETROLEUM

Bibliography: State Mineralogist Reports IV, VII, X, XII, XIII, XXIX, XXXI, XXXIII-XXXV. Bulletins 3, 11, 16, 19, 31, 32, 63, 69, 73, 82, 84, 89, 118. Reports of Oil and Gas Supervisor 1915 to date (issued in monthly chapters since April, 1919, to June, 1929, and quarterly from then on). U. S. Geol. Surv. Bulletins 213, 285, 309, 317, 321, 322, 340, 357, 398, 406, 431, 471, 541, 581, 603, 621, 623, 653, 691. Prof. Papers 116, 117. "American Petroleum; Supply and Demand"; Amer. Petr. Inst., 1925.

The crude petroleum produced in California during 1939 amounted to a total of 224,253,110 barrels having a value of $226,358,856 at the well. This was a decrease in both amount and value compared with the 1938 output which was 249,395,763 barrels worth $258,354,343.

This total of quantity is compiled from the monthly production reports filed by the operators with the State Oil and Gas Supervisor.

The question of the value of the crude oil yield at the well is a difficult one to settle with exactitude principally because a large part of the output is not sold until after refining. The large refiners are also large producers of crude oil which they send direct from well to plant, hence much of the crude oil is not sold as such.

The value used in the statistical reports of the State Mining Bureau and the Division of Mines from 1914 to 1927 (inc.) was derived

[1] Knudsen, E. T., The Petroleum Situation in the Pacific Coast Territory (Monthly for 1939), U. S. Bureau of Mines.

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from an average of actual sales of crude oil of all grades in each field of the State and their average applied to the total yield of each respective field. The 1929–1933 values, used by the Division of Mines, were obtained by using the production of crude oil by gravities produced in each field [1] and applying an average of current price quotations for crude oil at the well as compiled by California Oil and Gas Association.

The value given to the 1934–1938 petroleum output by this department was obtained by using the average gravity oil for each field, to which was applied the average quotation for the year of said grade oil.

TABLE A

Production and Value of Crude Oil by Counties

County	1938		1939	
	Barrels	Value	Barrels	Value
Fresno	20,784,106	$26,201,849	15,411,056	$18,077,169
Kern	66,093,496	58,803,255	58,893,865	48,664,001
Kings	8,717,827	12,117,779	9,871,899	14,115,828
Los Angeles	106,545,794	113,407,606	95,906,914	102,083,320
Orange	20,667,775	19,768,434	18,314,989	17,434,038
Santa Barbara	9,555,145	9,309,262	8,944,217	7,423,000
Ventura	16,979,962	18,707,689	16,866,086	18,530,769
San Bernardino, San Luis Obispo, San Mateo, Santa Clara, Tulare*	51,658	88,469	43,184	30,731
Totals	249,395,763	$258,354,343	224,253,110	$226,358,856

* Combined to conceal the output of operators in each.

The foregoing totals show an average price of $1.009 per barrel for the year 1939, as compared with $1.038 in the year 1938, $0.997 in 1937, $0.986 in 1936, $0.870 in 1935, $0.913 in 1934, and $0.831 in 1933.

TABLE B

Average Price of Oil per Barrel, by Counties, 1930-1939

County	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
Fresno	$0.568	$0.551	$0.556	$0.573	$0.650	$0.941	$1.209	$1.255	$1.261	$1.173
Kern	.838	.636	.658	.665	.729	.729	.863	.886	.890	.826
Kings	1.515	.723	.837	.934	1.085	1.045	1.338	1.390	1.390	1.430
Los Angeles	1.208	.784	.860	.892	.990	.914	.974	.968	1.064	1.064
Orange	1.060	.753	.762	.827	.937	.898	.937	.945	.956	.952
San Luis Obispo			.550							
Santa Barbara	1.404	.954	.962	.848	.951	.924	1.143	1.083	.974	.830
Santa Clara			.550							
Ventura	1.396	.771	.849	.838	.944	.901	.971	1.050	1.102	1.090
State averages	$1.195	$0.753	$0.807	$0.831	$0.913	$0.970	$0.986	$0.997	$1.038	$1.009

For several years previous to 1919, the State average value per barrel at the well for crude oil as determined by the statistical returns was noted to practically coincide with the quotations during the same years for 23° gravity oil in the San Joaquin Valley fields. In 1919 and since, the average values have worked out at figures corresponding to quotations up to, in one year as high as 28° oil, due to the large yield of high-gravity oils from the new fields in the Los Angeles-Orange counties area.

[1] By courtesy of Standard Oil Company of California.

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TOTAL PETROLEUM PRODUCTION OF CALIFORNIA

The presence of oil seepages and springs in Los Angeles and Ventura counties was known and utilized in a small way early in the history of California. Some also was shipped to refineries at San Francisco from Santa Barbara and Humboldt counties. In the light of present-day developments, the following reference to the previous year's production of oil and its future prospects as expressed by the San Francisco Bulletin of January 8, 1866, is strikingly prophetic even though skeptical:

"It is possible that the small quantity received (40,000 or 50,000 gallons in 1865) may be the forerunner of many millions which will, at some future time, lubricate the wheels of commerce and set a trade at work excelling in variety any that has thus far been known on this coast. At present, however, we admit to being a little skeptical about the assumption of the astute Professor Silliman that California will be found to have more oil in its soil than all the whales in the Pacific Ocean."

According to Hanks,[1] in 1874 production amounted to 36 bbl. per day from natural flows in Pico Cañon (Newhall), and at Sulphur Mountain (Ventura County), the oil being of 32° gravity average.

"Work was commenced in Pico Canyon in 1875 by drilling three shallow wells with spring pole, all of which yielded oil at depths of from 90 to 250 feet. Actual work of development commenced with steam machinery in 1877." [2]

In 1877 Pico averaged 40-50 bbl. daily, and Ventura 80 bbl. daily. In 1878, there was some production (at 60 bbl. per day, for a time) from wells in Moody Gulch, near Los Gatos, Santa Clara County, the oil being of 46° Baumé.

Photo by Walter W. Bradley

Playa Del Rey Oil Field, Los Angeles County

[1] Hanks, Henry G., Report IV of State Mineralogist, p. 298, 1884.
[2] *Idem.* p. 301.

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The first wells in the Coalinga, Fresno County, and Summerland, Santa Barbara County, fields were drilled in 1890, but Coalinga did not make its influence felt conspicuously on the state's annual output until 1903. The Summerland yield never has been large. The Salt Lake field near Los Angeles began production in 1894 and in 1897 reached over a million barrels annually.

In the Kern County fields, the first well was drilled in Sunset in 1891, Midway in 1900, McKittrick in 1892, Kern River in 1899. The Sunset-Midway district attained a yield of over 4,000,000 bbl. in 1909, and over 20,000,000 bbl. in 1910. Kern River field produced over 3,000,000 bbl. in 1901.

The first well in the Santa Maria-Lompoc group, Santa Barbara County, was drilled in 1901, and the district advanced to a yield of over 3,000,000 bbl. annually in 1905.

The Whittier-Fullerton field in Los Angeles and Orange counties became an important factor in 1902. The Montebello field, Los Angeles County, was the conspicuous addition in 1918-1919; and Elk Hills, Kern County, with Huntington Beach and Richfield, Orange County, in 1920. In 1921, the new fields added were Long Beach and Santa Fe Springs, Los Angeles County; in 1922, Torrance field in Los Angeles County, and Wheeler Ridge field in Kern County; but the production from the large number of new wells started in these new Los Angeles County fields did not reach its peak until August and September, 1923. Dominguez (Compton) came in during 1923; followed by Rosecrans and Inglewood in 1924. Ventura recorded important additions to its producing area in 1925 and 1926. Seal Beach, Orange County, and Mt. Poso, Kern County, were the new fields added in 1926; Round Mountain, Kern County, and Rincon, Ventura County, were the new fields added in 1927; with Potrero in Los Angeles County, Elwood in Santa Barbara County and Kettleman Hills in Kings County in 1928.

During 1929 Playa del Rey was added to the oil fields in Los Angeles County, and more recently a number of others have been added in Fresno, Los Angeles, Kern, and Santa Barbara.

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The effect of the advent of these various fields to the producing column will be noted in the tabulation herewith, by years:

TABLE C

Total Petroleum Production in California

Year	Barrels	Value	Year	Barrels	Value
To and including 1875	[a]175,000	[b]$472,500	1908	48,306,910	$26,566,181
1876	12,000	30,000	1909	58,191,723	32,398,187
1877	13,000	29,250	1910	77,697,568	37,689,542
1878	15,227	30,454	1911	84,648,157	40,552,088
1879	19,858	39,716	1912	89,689,250	41,868,344
1880	40,552	60,828	1913	98,494,532	48,578,014
1881	99,862	124,828	1914	102,881,907	47,487,109
1882	128,636	257,272	1915	91,146,620	43,503,837
1883	142,857	285,714	1916	90,262,557	57,421,334
1884	262,000	655,000	1917	95,396,309	86,976,209
1885	325,000	750,750	1918	99,731,177	127,459,221
1886	[a]377,145	[b]870,205	1919	101,182,962	142,610,563
1887	678,572	1,357,144	1920	103,377,361	178,394,937
1888	690,333	1,380,666	1921	112,599,860	203,138,225
1889	303,220	368,048	1922	138,468,222	173,381,265
1890	307,360	384,200	1923	262,875,690	242,731,309
1891	323,600	401,264	1924	228,933,471	274,652,874
1892	385,049	561,333	1925	232,492,147	330,609,829
1893	470,179	608,092	1926	224,673,281	345,546,677
1894	783,078	1,064,521	1927	231,195,774	260,735,498
1895	1,245,339	1,000,235	1928	231,811,465	229,998,680
1896	1,257,780	1,180,793	1929	292,534,221	321,366,863
1897	1,911,569	1,918,269	1930	227,328,988	271,699,046
1898	2,249,088	2,376,420	1931	188,310,605	141,835,723
1899	2,677,875	2,660,793	1932	177,745,286	142,890,247
1900	4,319,950	4,152,928	1933	172,139,362	143,063,972
1901	7,710,315	2,961,102	1934	174,721,282	159,529,671
1902	14,356,910	4,692,189	1935	205,979,855	179,335,311
1903	24,340,839	7,313,271	1936	214,776,227	211,667,185
1904	29,736,003	8,317,809	1937	238,558,562	237,845,872
1905	34,275,701	9,007,820	1938	249,395,763	258,354,343
1906	32,624,000	9,238,020	1939	224,253,110	$226,358,856
1907	40,311,171	16,783,943	Totals	5,372,369,272	$5,347,582,389

[a] U. S. G. S., Min. Res. of U. S., 1886, p. 440, for quantities to and including 1886.
[b] Values have been estimated for the years to and including 1886, after consulting a number of contemporaneous publications, including the Mining & Scientific Press, Reports of the State Mineralogist, and U. S. Reports. The figures for 1887 to date are from records of the State Mining Bureau.

Well Data:

The following table is compiled from monthly statements issued by the American Petroleum Institute:

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TABLE D

Wells Operated, by Fields, 1939

Field	Wells producing Dec., 1938	Wells producing Dec., 1939	Wells completed during year	Daily initial output	Wells abandoned during year	Bbls. per well produced per day Dec., 1938	Bbls. per well produced per day Dec., 1939
GROUP NO. 1:							
Arvin		13	14	23,777	1		183.8
Belridge—North	59	76	14	7,959	1	219.8	155.1
Belridge—South	87	83			3	13.6	13.8
Canal	15	31	16	25,385		259.5	191.0
Canfield Ranch	1	1			7	41.0	68.0
Coalinga	816	871	58	137,204	26	11.7	24.4
Coles Levee	1	12	13	10,397	2	179.0	154.5
Edison	88	92	5	365	4	28.6	24.1
Elk Hills	170	192	2	197	2	59.7	63.4
Fruitvale	174	174	9	1,140	16	42.4	35.3
Greeley	11	26	11	35,776	2	200.7	110.7
Kern River	1,369	1,571	30	301	18	8.3	7.3
Kettleman Middle Dome	3				1	13.0	
Kettleman North Dome	218	243	40	83,824	5	274.6	215.2
Lost Hills	243	290	1	69	3	13.2	16.8
McKittrick	187	200	4	229	7	18.6	17.8
Midway-Sunset	2,519	2,572	18	1,673	39	22.5	19.7
Mountain View	189	186	2	220	12	48.9	39.1
Mount Poso	265	272	12	3,081	8	52.1	39.5
Paloma		1	1	2,246	1		174.0
Rio Bravo	24	38	14	31,250	4	358.5	209.8
Round Mountain	193	206	12	2,051	6	66.8	39.0
Strand		6	6	15,737			193.2
Ten Section	26	31	11	29,978		335.3	268.6
Tupman		5	4	5,065			205.8
Wasco	3	7	4	19,047		211.0	159.3
Wheeler Ridge	27	33	1	104		11.4	10.0
GROUP NO. 2:							
Capitan	51	45			1	55.1	46.3
Elwood	80	81			2	60.1	49.9
Rincon	51	54	6	1,969	2	75.2	74.4
San Miguelito	19	21	4	4,574	3	131.0	139.5
Santa Barbara	34	27	3	244	19	12.4	10.0
Santa Maria	304	270	16	34,066	12	51.4	54.8
Summerland	18	17			3	1.3	1.6
Ventura Avenue	258	275	36	51,652		131.4	132.4
Ventura-Newhall	559	552	17	8,479	16	9.4	12.3
Watsonville	7	7				2.3	4.3
GROUP NO. 3:							
Brea-Olinda	350	356	2	235	6	16.1	15.6
Coyote-East	86	78	3	989	1	32.1	37.2
Coyote-West	49	60	3	1,609		166.3	103.9
Dominguez	207	170	16	13,701	2	118.0	111.2
El Segundo	52	47			3	96.3	59.2
Huntington Beach	551	529	23	7,495	25	55.6	52.8
Inglewood	208	208			2	62.1	62.8
Lawndale	6	5			2	12.2	9.2
Long Beach	1,260	1,210	9	1,174	23	41.2	36.6
Los Angeles-Salt Lake	112	111			3	4.3	4.7
Montebello	221	340	128	86,937	7	74.1	79.7
Playa del Rey	183	160	1	90	20	30.3	28.1
Potrero	13	16	3	776	1	77.8	81.3
Richfield	293	304	2	75	8	28.0	28.4
Rosecrans	112	138	31	10,690	9	132.6	72.5
Santa Fe Springs	590	565	1	394	29	51.1	46.1
Seal Beach	109	118	2	309	7	71.8	59.0
Torrance	659	699	70	25,667	33	29.2	18.8
Whittier	147	144			2	6.1	7.0
Wilmington	590	759	174	86,429	2	156.2	106.9
GROUP NO. 4—Gas Fields:							
Buena Vista Lake	4	4			1		
Buttonwillow	26	20			5		
Chowchilla							
Delano		9	10	Gas			
Dudley Ridge							
Fairfield Knolls			1	Gas			
Goleta					3		
Marysville Buttes		3	1	Gas			
McDonald Island	5	5					
Rio Vista	22	22	1	Gas			
Semi-Tropic	1	2			2		
Tracy	5	5			1		
Miscellaneous drilling					102		
Totals	13,930	14,668	865	774,629	525	46.4	41.8

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Specific Gravity of Oils Produced.

The proportion of heavy and light oil produced in the various fields is shown in Table E, on page 26, for which we are indebted to the Standard Oil Company. Specific gravities in California range from 8° Baumé in the Casmalia field, Santa Barbara County, to 60° in Kettleman Hills, Kings County.

California crude oils are all essentially of asphalt base, with a few notable exceptions. In the following localities are wells yielding crudes containing both asphalt and paraffine constituents: Oil City field, Coalinga; a few deep wells in East Side field, Coalinga; a considerable part of the Ventura County field; Western Minerals area, south of Maricopa; Wheeler Ridge, Kern County.

Oil in "Storage."

Field, refinery, pipe-line and tank-farm stocks of crude and refined products in the Pacific Coast[1] territory totaled 151,935,248 barrels December 31, 1939, as compared with 157,684,289 barrels on December 31, 1938. The total decrease in stock over the preceding year was 5,749,041 barrels.

	Dec. 31, 1938 (barrels)	Dec. 31, 1939 (barrels)
1. Gasoline-bearing crude	36,225,312	35,136,501
2. Non-gasoline-bearing crude	16,282,177	13,303,091
3. Unblended natural gasoline	2,699,455	1,516,033
4. Gasoline (not including distributing and service stations)	13,259,369	16,128,052
5. Naphtha distillates	[a]1,566,349	[a]1,282,484
6. Gas oil and Diesel oil	10,539,937	9,671,299
7. Fuel oil residuum	70,957,881	66,886,434
8. All other stocks	[b]6,153,809	[b]8,011,354
Totals	157,684,289	151,935,248
[a]. Estimated amount of unfinished gasoline contained in item No. 5	1,350,379	1,032,536
[b]. Coke included in item No. 8	92,066	976,545

Utilization of California Crude Oil.

Most of the crude oil produced in California is sent to storage reservoirs at tank farms near the oilfields and from these reservoirs by pipelines to the refineries, the larger ones of which are located in the vicinity of Los Angeles and on San Francisco Bay.

During 1939 the crude oil consumed in California according to the U. S. Bureau of Mines[2] was 192,804,000 barrels sent to the still at the refineries; 21,813,000 barrels to Pacific foreign shipment; 947,000 barrels to intercoastal shipments; 8,881,000 barrels were either consumed as fuel or added to residuum and nongasoline-bearing crude; and 1,031,000 barrels to domestic market and loss not accounted for elsewhere.

[1] American Petroleum Institute: Summary of California Oilfield Operations for December, 1939.

[2] Knudsen, E. T., The petroleum situation in the Pacific Coast territory (monthly) 1939, U. S. Bureau of Mines.

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TABLE E

Production of Light and Heavy Oils, by Fields, for 1939

Field	Under 20° (barrels)	20° and above (barrels)	Total (barrels)
San Joaquin Valley—			
Arvin		346,945	346,945
Belridge—South	1,807	416,719	418,526
Canal		1,895,141	1,895,141
Canfield Ranch		21,633	21,633
Coalinga	2,068,407	1,298,103	3,366,510
Coalinga—Eocene		2,370,330	2,370,330
Coles Levee		319,703	319,703
Devils Den	4,761		4,761
Edison	457,728	420,236	877,964
Elk Hills	938,166	2,891,393	3,829,559
Fruitvale	1,965,394	343,534	2,308,928
Grapevine		13,837	13,837
Greeley		811,494	811,494
Kern River	3,624,923		3,624,923
Kettleman Hills (North Dome)		19,557,749	19,557,749
Kettleman Hills (Middle Dome)		8,832	8,832
Lost Hills	608,408	610,759	1,219,167
McKittrick	1,316,501	7,821	1,324,322
Midway-Sunset	7,743,761	11,208,042	18,951,803
Mountain View	13,165	3,055,486	3,068,651
Mount Poso	4,228,930		4,228,930
Paloma		23,207	23,207
Poso Creek	553,625		553,625
Richfield		206,712	206,712
Rio Bravo		3,008,940	3,008,940
Round Mountain	3,374,942	129,821	3,504,763
Strand		91,476	91,476
Ten Sections		3,247,160	3,247,160
Terra Bella	810		810
Wasco		402,644	402,644
Wheeler Ridge		124,457	124,457
Belridge—North	4,040	4,398,222	4,402,262
Coastal—			
Arroyo Grande	20,785	10,070	30,855
Capitan		872,455	872,455
Elwood		1,545,541	1,545,541
Lompoc	81,779	27,456	109,235
Newhall	5,844	652,310	658,154
Rincon		1,237,325	1,237,325
San Miguelito		951,196	951,196
Santa Barbara Mesa	111,881		111,881
Santa Maria	5,243,951	893,925	6,137,876
Summerland	9,991		9,991
Ventura Avenue		12,932,404	12,932,404
Ventura County	61,003	1,594,896	1,655,899
Watsonville	10,800		10,800
Southern California—			
Brea Olinda	276,621	1,785,670	2,062,291
Coyote (East)	28,324	915,284	943,608
Coyote (West)		3,072,080	3,072,080
Domingues		7,131,354	7,131,354
El Segundo	261,833	905,323	1,167,156
Huntington Beach	598,560	9,386,746	9,985,306
Inglewood	256,950	4,348,497	4,605,447
Lawndale		19,236	19,236
Long Beach	58,319	16,847,164	16,905,483
Los Angeles	71,986		71,986
Montebello	133,830	7,299,473	7,433,303
Playa del Rey	58,378	1,741,324	1,799,702
Potrero		408,278	408,278
Richfield	622,262	2,510,197	3,132,459
Rosecrans		4,460,806	4,460,806
Salt Lake	118,248		118,248
Santa Fe Springs		10,049,728	10,049,728
Seal Beach		2,637,894	2,637,894
Torrance	1,609,152	4,806,873	6,416,025
Whittier	251,955	102,745	354,700
Wilmington	7,871,760	23,227,732	31,099,492
Miscellaneous	50		50
Grand totals	44,669,630	179,604,378	224,274,008

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The production of petroleum products during 1939 is shown in Table F:

TABLE F

Commodity	Amount in barrels
Crude petroleum to stills	192,804,000
Natural gas gasoline, including liquid petroleum gas	14,443,000
Gasoline	80,096,000
Kerosene	3,788,000
Lubricating oils and greases	3,295,000
Gas oil and Diesel oil	27,918,000
Residuum and non-gasoline-bearing crudes[a]	77,934,000
Asphalt and road oil	6,216,000
Refinery losses and still gas production	7,300,000
Total petroleum (net)[b]	207,247,000

[a] Includes 8,881,000 bbls. of heavy crude oil.
[b] Total of crude oil and natural gas gasoline.

Operating Data.

The following tabulation (Table G) is compiled from data published by the State Division of Oil and Gas,[1] semiannually, and here combined to show the entire year's operations for all fields. The districts are the geographical subdivisions as administered by that Division and which are outlined on the accompanying map.

It will be noted that the State average yield of oil per-well-per-day was 50.0 barrels for the first six months of 1939 and 47.4 barrels for the second. This is somewhat higher than the figures 41.8 barrels average for December derived from American Petroleum Institute data as shown in Table D, on a previous page, due in part at least, to the fact that the latter is on a full-time basis, whereas the Division's figures allow for shut-down time.

[1] Summary of Operations—California Oil Fields; Division of Oil and Gas, Fifteenth Annual Report of State Oil and Gas Supervisor, Vol. 35, No. 1, July, Aug., Sept., 1939, and No. 3, Jan., Feb., March, 1940.

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TABLE G

Production Statistics and Operating Data of California Oil Fields—1939

Field	January 1 to June 30						July 1 to December 31					
	Average number of producing wells—actual	Oil (bbls.)	Number of days producing	Production per well per day (bbls.)		Percentage of time wells produced	Average number of producing wells—actual	Oil (bbls.)	Number of days producing	Production per well per day (bbls.)		Percentage of time wells produced
				Oil	Water					Oil	Water	
Dist. 1—Aliso Canyon	2	65,093	228	285.5	1.2	63.0	4	140,083	553	262.8	2.2	72.4
Beverly Hills	4	17,733	552	32.1	71.7	76.2	3	22,833	557	41.0	100.3	100.0
Brea-Olinda	329	1,031,295	52,147	19.8	18.0	87.6	334	1,071,110	54,383	19.7	19.4	88.5
Coyote Hills	144	1,973,625	22,766	86.7	44.6	87.3	159	2,195,041	26,411	83.1	47.2	90.0
Dominguez	182	3,766,669	27,370	137.6	65.3	83.1	163	3,360,590	25,143	133.7	62.7	83.8
El Segundo	50	631,085	8,340	75.7	66.9	92.2	49	541,652	8,400	64.5	67.1	93.2
Huntington Beach	567	5,070,444	92,859	54.6	48.1	90.5	564	4,854,684	94,826	51.2	48.2	91.4
Inglewood	209	2,245,180	26,882	83.5	64.3	71.1	217	2,357,332	29,480	80.0	67.5	73.8
Lawndale	6	10,759	1,009	10.7	46.7	92.9	5	8,242	899	9.2	49.6	97.7
Long Beach	1,252	8,622,932	209,473	41.2	81.5	92.4	1,218	8,059,393	208,870	38.6	81.8	93.2
Los Angeles City	79	31,739	13,930	2.3	4.4	97.4	78	33,375	13,894	2.4	4.7	96.8
Montebello	227	2,919,038	34,137	85.5	104.7	83.1	285	4,508,978	46,443	97.1	73.3	88.6
Newhall	72	195,620	12,933	15.1	3.3	99.2	70	257,494	12,698	20.3	3.1	98.6
Playa del Rey	188	906,230	32,044	28.3	69.5	94.2	174	828,414	30,565	27.1	66.2	95.5
Potrero	14	189,063	2,357	80.2	58.4	93.0	16	211,656	2,634	80.4	73.1	89.5
Richfield	293	1,463,737	44,635	32.8	16.1	84.2	297	1,517,465	49,915	30.4	16.3	91.3
Rosecrans	126	2,538,382	21,243	119.5	36.7	93.1	137	1,953,491	23,715	82.4	33.2	94.1
Salt Lake	8	43,153	1,380	31.3	111.8	95.3	8	42,215	1,388	30.4	115.6	94.3
Santa Fe Springs	579	5,114,792	95,167	53.7	104.5	90.8	575	4,928,806	97,659	50.5	103.3	92.3
Seal Beach	109	1,349,294	17,227	78.3	235.7	87.3	112	1,299,623	17,416	74.6	214.2	84.5
Torrance	706	3,655,362	118,849	30.8	7.9	93.0	713	2,736,887	123,591	22.1	7.5	94.2
Whittier	153	179,647	25,650	7.0	19.7	92.6	150	174,878	24,947	7.0	19.3	90.4
Wilmington	599	15,418,623	102,831	149.9	1.8	94.8	702	15,672,674	122,039	128.4	1.9	94.5
Los Angeles County	3	3,051	463	6.6	11.0	85.3	3	2,441	441	5.5	10.9	80.0
San Bernardino County	1	659	91	7.2	0.1	50.3	1	399	85	4.7	Negative	46.2
Totals	5,902	57,443,205	964,563	59.6	52.9	90.3	6,037	56,779,756	1,016,932	55.8	50.3	91.5
Dist. 2—Bardsdale	136	233,652	21,339	10.9	2.6	86.7	137	287,625	22,925	12.5	2.0	90.9
Conejo	0	0	0	0	0	0	0	0	0	0	0	0
Ojai	58	27,933	9,080	3.1	2.7	86.5	60	26,790	9,192	2.9	3.2	83.3
Piru	92	165,214	14,521	11.4	13.1	87.2	92	168,260	14,802	11.4	11.6	87.4
Rincon	70	1,060,673	10,292	103.1	24.5	81.2	78	1,132,721	11,746	96.4	23.3	81.8
Santa Paula	44	14,697	5,850	2.5	4.0	73.5	48	14,803	6,542	2.3	3.9	74.1
Sespe	24	52,130	3,317	15.7	10.4	76.4	24	62,467	3,215	19.4	11.4	72.8
Simi	54	17,341	8,392	2.1	0.7	85.9	54	17,783	8,664	2.1	2.1	87.2
South Mountain	85	272,733	13,214	20.6	0.8	85.8	86	281,883	12,983	21.7	0.9	82.0
Ventura	278	6,299,462	41,412	152.1	27.1	82.3	277	6,650,875	44,291	150.2	24.7	86.9
Ventura County	2	31,786	362	87.8	0.9	100.0	2	47,258	353	133.9	0.2	95.9
Totals	843	8,175,621	127,779	64.0	13.5	83.7	858	8,690,465	134,713	64.5	12.6	85.2

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DIST. 3—Arroyo Grande	13	16,419	1,929	8.5	2.6	82.0	15	14,838	2,007	7.4	1.0	72.7
Capitan	46	465,998	6,332	73.6	21.6	76.1	45	409,928	7,002	58.5	18.3	84.6
Casmalia	3	25,422	310	82.0	16.4	57.1	7	56,103	637	88.1	16.9	49.5
Cat Canyon	18	580,584	2,227	260.7	12.8	68.4	17	524,325	1,885	278.2	14.3	60.3
Elwood	74	794,664	11,239	70.7	185.6	83.9	74	751,718	10,670	70.5	190.7	78.4
Half Moon Bay	2	1,336	358	3.7	0	98.9	2	708	332	2.1	0	90.2
La Goleta Gas	[2]0	0	0	0	0	0	[2]0	0	0	0	0	0
Lompoc	7	53,573	792	67.6	83.6	62.5	7	59,207	1,016	58.3	93.3	78.9
Mesa	30	54,721	5,182	10.6	100.0	95.4	27	49,019	4,729	10.4	113.4	95.2
Moody Gulch							1	656	17	38.6	5.5	9.2
Santa Maria	123	403,438	18,880	21.4	29.7	84.8	126	447,128	19,806	22.6	26.8	85.4
Santa Maria Valley	129	2,089,196	14,630	142.8	1.7	62.7	95	2,167,638	9,191	235.8	2.1	52.6
Sargent	8	4,057	1,104	3.7	0	76.2	8	4,012	834	4.8	0	56.7
Summerland	7	5,615	1,221	4.6	15.5	96.4	7	5,940	1,124	5.3	17.6	87.3
Totals	460	4,495,023	64,204	70.0	53.7	77.1	431	4,491,220	59,250	75.8	57.4	74.7
DIST. 4—Belridge	191	2,373,072	31,486	75.4	17.3	91.1	192	2,404,791	32,494	74.0	15.8	92.0
Buena Vista Lake Gas	[3]3	0	0	0	0	0						
Buttonwillow Gas	[3]14	0	0	0	0	0	[2]15	0	0	0	0	0
Canal	20	808,748	3,420	236.5	6.3	94.5	28	1,053,567	4,747	221.9	8.6	92.1
Canfield Ranch	1	6,275	83	75.6	0	45.9	1	15,358	170	90.3	0.8	92.4
Coles Levee	4	130,437	588	221.8	4.2	81.2	13	395,985	1,877	211.0	2.7	78.5
Devils Den	2	2,371	248	9.6	50.8	68.5	6	2,353	480	4.9	5.6	43.5
Edison	86	460,518	11,585	39.8	18.2	74.4	86	435,741	12,320	35.4	18.7	77.9
Elk Hills	170	1,827,435	28,729	63.6	103.6	93.4	177	1,993,417	30,257	65.9	106.1	92.9
Elk Hills	[2]0	0	0	0	0	0	[2]0	0	0	0	0	0
Fruitvale	164	1,234,182	23,820	51.8	28.6	80.2	165	1,137,512	24,023	47.4	29.8	79.1
Greeley	18	347,598	2,410	144.2	60.3	74.0	21	463,454	3,218	144.0	105.0	83.3
Kern River	1,385	1,813,020	227,200	8.0	35.3	90.6	1,606	1,972,213	267,319	7.4	38.1	90.5
Lost Hills	266	584,921	45,083	13.0	32.1	93.6	293	630,798	48,834	12.9	54.3	90.6
McKittrick-Temblor	207	643,829	33,688	19.1	93.7	89.9	210	670,080	35,486	18.9	94.1	91.8
Midway-Sunset	2,539	9,836,359	394,198	25.0	31.3	85.8	2,570	9,170,574	405,372	22.6	31.9	85.7
Midway-Sunset	[2]23	0	0	0	0	0	[2]21	0	0	0	0	0
Mt. Poso	257	2,333,842	36,552	63.8	191.4	78.6	246	1,928,443	33,137	58.2	206.3	73.2
Mountain View	176	1,605,417	26,158	61.4	29.2	82.1	187	1,816,599	30,100	60.4	26.7	87.5
Mountain View	[2]1	0	0	0	0	0	[2]1	0	0	0	0	0
Paloma							1	23,207	118	196.7	0	64.1
Paloma [a]							[3]3	0	0	0	0	0
Poso Creek	64	233,422	9,510	24.5	42.3	82.1	63	220,444	9,365	23.5	47.1	80.8
Rio Bravo	28	1,433,921	4,914	291.8	1.8	97.0	35	1,447,889	6,216	232.9	2.8	96.5
Round Mountain	195	1,983,181	30,976	64.0	210.4	87.8	196	1,533,934	29,542	51.9	210.4	81.9
Semitropic Gas	[2]9	0	0	0	0	0	[2]5	0	0	0	0	0
Strand							4	131,845	521	253.1	13.5	70.8
Ten Section	28	1,611,676	4,500	358.2	7.1	88.8	31	1,635,138	5,299	308.6	7.8	92.9
Trico Gas	[2]5	0	0	0	0	0	[3]14	0	0	0	0	0
Wasco	5	162,618	692	235.0	5.2	76.5	7	239,622	1,165	205.7	12.4	90.6
Wheeler Ridge	33	64,209	5,350	12.0	3.2	89.6	34	60,340	6,040	10.0	2.4	96.5
Kern County	2	6,888	260	26.5	14.9	71.8	2	6,622	271	24.4	12.6	73.6
Tulare County	1	1,000	120	8.3	412.5	66.3	0	0	0	0	0	0
Totals	5,842	29,504,939	921,570	32.0	48.1	87.2	6,174	29,389,926	988,371	29.7	49.1	87.0

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TABLE G—Continued

Production Statistics and Operating Data of California Oil Fields—1939

Field	January 1 to June 30						July 1 to December 31					
	Average number of producing wells—actual	Oil (bbls.)	Number of days producing	Production per well per day (bbls.)		Percentage of time wells produced	Average number of producing wells—actual	Oil (bbls.)	Number of days producing	Production per well per day (bbls.)		Percentage of time wells produced
				Oil	Water					Oil	Water	
Dist. 5—Coalinga	733	1,252,875	116,836	10.7	15.7	88.1	839	2,095,890	136,338	15.4	15.7	88.3
East Coalinga Extension	17	754,655	1,885	400.3	1.5	61.3	42	1,621,984	4,509	359.7	1.2	58.3
Kettleman Middle Dome	3	6,244	480	13.0	175.5	88.4	1	2,591	143	18.1	197.2	77.7
Kettleman North Dome	219	9,982,145	35,202	283.6	51.3	88.8	235	9,566,571	38,102	251.1	48.9	88.1
McDonald Island Gas	[2]6	0	0	0	0	0	[2]5	0	0	0	0	0
Rio Vista Gas	[2]17	0	0	0	0	0	[2]18	0	0	0	0	0
Tracy Gas	[2]3	0	0	0	0	0	[2]4	0	0	0	0	0
Glenn County—Willows Area	[2]0	0	0	0	0	0	[2]0	0	0	0	0	0
Humboldt County—Eureka Area							[2]1	0	0	0	0	0
Madera County—Chowchilla Area	[2]0	0	0	0	0	0	[2]0	0	0	0	0	0
Solano County—Potrero Hills Area							[2]0	0	0	0	0	0
Sutter County—Marysville Buttes Area	[2]3	0	0	0	0	0	[2]3	0	0	0	0	0
Yolo County—Fairfield Knolls Area	[2]0	0	0	0	0	0	[2]0	0	0	0	0	0
Totals	972	11,995,919	154,403	77.7	24.1	87.8	1,117	13,287,036	179,092	74.2	22.5	87.1
Grand totals	14,019	111,614,707	2,232,519	50.0	46.7	87.8	14,617	112,638,403	2,378,358	47.4	45.8	88.8

[2] Gas wells omitted from totals.
(a) Formerly Buena Vista Lake Gas.

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Proved Oil Land.

The total proved oil and natural gas land of California as of January 1, 1940 is 173,992 acres; an increase of 7,812 acres during the year 1939 according to data furnished by the Division of Oil and Gas. The acreage as of January 1, 1940 was distributed by counties as follows:

TABLE H

Proved Oil and Natural Gas Land January 1, 1940

County	*Acres*
Fresno	21,215
Kern	88,382
Kings	8,114
Los Angeles	16,993
Orange	6,323
Sacramento	245
San Bernardino	10
San Joaquin	1,410
San Luis Obispo	390
Santa Barbara	16,867
Santa Clara	80
Solano	4,795
Tulare	2,040
Ventura	7,128
Total	173,992

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CHAPTER THREE

METALS

Bibliography: Reports of State Mineralogist I-XXXVI (inc.). Bulletins 5, 6, 18, 23, 27, 36, 50, 57, 76, 78, 85, 92, 95, 108. Spurr and Wormser, "Marketing of Metals and Minerals." See also under each metal.

The total value of metals produced in California during 1939 was $55,375,873. Chief among these is and always has been gold, followed by silver, tungsten ore, quicksilver, copper, iron ore, lead, chromite, platinum group metals, and molybdenum ore.

A comparison of the 1938 output with that of the 1939 output is afforded by the following table:

Substance	1938		1939		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Antimony			150 tons	$4,552	$4,552+
Chromite	982 tons	$10,864	3,936 tons	52,673	41,809+
Copper	1,613,491 lbs.	158,122	8,390,215 lbs.	872,582	714,460+
Gold	1,311,129 fine oz.	45,889,515	1,435,264 fine oz.	50,234,240	4,344,725+
Iron		*	16,990 tons	77,788	—
Lead	1,003,096 lbs.	46,142	1,061,294 lbs.	49,880	3,738+
Platinum group metals	1,069 fine oz.	35,150	896 fine oz.	32,135	3,015—
Quicksilver	12,171 flasks	846,497	11,201 flasks	1,102,563	256,066+
Silver	2,590,804 fine oz.	1,674,863	2,599,139 fine oz.	1,764,264	89,401+
Tungsten	768 tons	786,860	74,110 tons	1,153,735	366,875+
Zinc	17,554 lbs.	843	16,390 lbs.	852	9+
Unapportioned		141,406		[b]30,609	110,797—
Total values		$49,590,262		$55,375,873	
Net increase					$5,785,612

* Included under "unapportioned."
[b] Includes manganese, molybdenum and titanium.

ALUMINUM

Bibliography: Report XVIII, p. 198, XXXIV. Bulletins 38, 67. U. S. Geol. Surv., Min. Res. of U. S.

To date there has been no commercial production of aluminum ore in California. Only a single authenticated occurrence of bauxite has thus far been noted in this state, being in Riverside County southeast of Corona, but as yet undeveloped.

Minerals containing aluminum are abundant, the most widely distributed being the clays. There are only two, however, thus far of consequence commercially, in the production of the metal: bauxite (to which may be added the related hydrated oxides, hydrargillite and diaspore) and cryolite. Cryolite is found in commercial quantities only in south Greenland, and was formerly the only ore of aluminum used, being still employed as a flux in the extraction of the metal. Bauxite has been for some years the most important source of aluminum and its salts. Its color varies from gray to red, according to the amount of iron present, the composition ranging usually between the following limits:

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Al_2O_3, 30%–60%; Fe_2O_3, 3%–25%; SiO_2, 0.5%–20%; TiO_2, 0.0–10%. Besides its reduction to the metal bauxite is also utilized in the manufacture of aluminum salts, refractories, alundum (fused alumina) for use as an abrasive, and in the refining of oil.

ANTIMONY

Bibliography: State Mineralogist Reports VIII, X, XII-XV (inc.), XVII, XXII, XXIII, XXV-XXVII (inc.), XXXI, XXXIV. Bulletins 38, 91.

During 1939 there were shipments of antimony ore in California, coming from properties in Inyo, Kern, and San Bernardino counties and amounted to 150 short tons valued at $4,552. The above was the first output of antimony ore since 1928.

Pure antimony metal and manufactured antimony compounds are of considerable importance as pigments in the ceramic industry. The most important use of the metal, commercially, is in various alloys, particularly type-metal (with tin and lead), babbitt (with tin and copper), and britannia metal (with tin and copper). An alloy of 6% antimony and 94% lead is being extensively used in making battery plates for storage batteries for automobiles, airplanes and radio apparatus.

Present New York quotations (July 18, 1940) are around 16.5¢ per pound for Chinese (duty paid) and 14¢ for domestic antimony.

Antimony Production in California, by Years.

The production of antimony ore in California by years since 1887 has been as follows:

Year	Tons	Value	Year	Tons	Value
1887	75	$15,500	1902		
1888	100	20,000	1915	510	$35,666
1889			1916	1,015	64,793
1893	50	2,250	1917	158	18,786
1894	150	6,000	1918		
1895	33	1,485	1925	*26	770
1896	17	2,320	1926		
1897	20	3,500	1927	20	590
1898	40	1,200	1928	20	761
1899	75	13,500	1929		
1900	70	5,700	1939	150	4,552
1901	50	8,350	Totals	2,579	$205,732

* Annual details concealed under 'Unapportioned.'

ARSENIC

Bibliography: Reports XVIII, XXIII, XXV, XXX, XXXIII, XXXV. Bulletin 67. U. S. G. S., Min. Res. of U. S.

Arsenic is found in a number of localities in California in the mineral arsenopyrite (FeAsS), which is frequently gold bearing; and in scorodite ($FeAsO_4+2H_2O$), an oxidation product of arsenopyrite. The occurrence of realgar (AsS) has also been noted.

Except for a small output in 1924, there has been no commercial recovery of arsenic from California ores. There having been only a single operator, the figures are concealed under the 'Unapportioned' item.

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BERYLLIUM

Bibliography: State Mineralogist Report XXVII, XXXV. Eng. & Min. Jour.-Press, Vol. 118, No. 8, p. 285, Aug. 23, 1924. U. S. Bureau of Mines Information Circular 6190.

Beryllium is a metal resembling aluminum closely in its chemical character. It has a specific gravity of 1.85, is almost as hard as quartz (will scratch glass) and will take a high polish. The use of beryllium as a metal is still more or less in the experimental stage because the cost of extracting the metal from its ores almost makes it prohibitive and the present sources of supply of the ore are limited. Not until such a time when deposits can be found that will assure a definite supply and metallurgical costs are such as to justify its use, will the metal be found in common use.

There are a number of berryllium minerals, but none have been found in commercial quantities, except beryl, which is a beryllium-aluminum silicate. The chief use at present for ground beryl is as an addition to porcelain products, where it reduces the coefficient of expansion. Beryllium metal is difficult to separate from aluminum.

Present (May 30, 1940) quotations for beryllium ore are per ton in carload lots, minimum 10 per cent BeO, $30; minimum 12 per cent BeO, $35, f.o.b. mine.

Beryl occurs in California in the pegmatite dikes of the tourmaline gem district in northern San Diego and northwestern Riverside counties; and an occurrence has recently been noted in western Inyo County, but the quantity is as yet unproved. Thus far there have been no commercial shipments of beryl from California except for gem purposes (the pink and aquamarine varieties).

BISMUTH

Bibliography: State Mineralogist Report XXXV. Bulletins 38, 67, 91. Am. Jour. Sci., 1903, Vol. 16.

Several bismuth minerals have been found in California, notably native bismuth and bismite (the ochre) in the tourmaline gem district in San Diego and Riverside counties near Pala. Other occurrences of bismuth minerals, including the sulphide, bismuthinite, have been noted in Inyo, Fresno, Nevada, Tuolumne, San Bernardino, and Mono counties, but only in small quantities. The only commercial production recorded was 20 tons valued at $2,400 in 1904, and credited to Riverside County.

The uses of bismuth are somewhat restricted, being employed principally in the preparation of medicinal salts, and in low melting-point or cliché alloys. These alloys are utilized in automatic fire sprinkler systems, in electric fuses, and in solders.

The present quotation (May 9, 1940) for bismuth is $1.25 per pound, in ton lots for the refined metal.

CADMIUM

Bibliography: U. S. Geol. Surv., Min. Res. of U. S., 1908, 1918.

During 1917 and 1918, cadmium metal was recovered by the electrolytic zinc plant of the Mammoth Copper Company in Shasta County.

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It was shipped in the form of 'sticks' and amounted to a total of several thousand pounds for the two years, the exact figures being concealed under 'Unapportioned.' That was the first, and thus far the only, commercial production of cadmium recorded from California ore. Cadmium occurs there associated with zinc sulphide, sphalerite. Cadmium also occurs in the Cerro Gordo Mines, Inyo County, associated with smithsonite (zinc carbonate).

Cadmium is produced in the United States in two forms—metallic cadmium and the pigment, cadmium sulphide. The principal use of the metal is in low-melting point, or cliché alloys, and its salts are utilized in the arts, medicine, and in electroplating. The sulphide is employed as a paint pigment, being a strong yellow, which is unaffected by hydrogen sulphide gas from coal smoke. It is also employed in coloring glass and porcelain. Cadmium cliché metal is stated to be superior to the corresponding bismuth alloy, for making stereotype plates. Cadmium is also used in bronze telegraph and telephone wires, and gives some promise of being utilized in electroplating.

The present quotation (May 16, 1940) for cadmium is 80¢ per pound for the refined metal.

CHROMITE

Bibliography: State Mineralogist Reports IV, XII, XIII, XIV, XV, XVII, XVIII, XXI-XXIX (inc.), XXXI, XXXIV. Bulletins 38, 76, 91. Preliminary Report 3. U. S. G. S., Bull. 430. Min. & Sci. Press, Vol. 114, p. 552.

During 1939 there were shipments of chromite or chrome iron ore in California amounting to 3,936 short tons recalculated to a basis of 45% Cr_2O_3 valued at $52,673. The 1939 output showed an increase in amount and value as compared with that of 1938 which was 982 short tons worth $10,864, and was the largest annual yield since 1919. The 1939 shipments came from properties in Del Norte, El Dorado, Plumas, Siskiyou, and Tuolumne counties.

Occurrence.

Chromite is widely distributed in California, the principal production, thus far, having come from El Dorado, San Luis Obispo, Del Norte, Shasta, Siskiyou, Placer, Fresno, and Tuolumne counties. In 1918 a total of 29 counties contributed to the State's output. There are two main belts in California yielding this mineral, one along the Coast Ranges from San Luis Obispo County to the Oregon line, including the Klamath Mountains at the north end, and the other in the Sierra Nevada from Tulare County to Plumas County. Chromite occurs as lenses in basic igneous rocks such as periodotite and pyroxenite, and in serpentines which have been derived by alteration of such basic rocks.

Uses.

The major consumption of chromite ore is for use as a refractory lining in smelting furnaces for steel and copper. A smaller portion is used in the preparation of ferrochrome for chrome-steel alloys, and of chromium chemicals, the latest development of which is chrome plating

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as used in the automobile industry, on ships, and in oil refineries to protect metal surfaces from wear and erosion.

Imports.

Imports of foreign chromite[1] to the United States duty free during 1939, came mainly from Southern Rhodesia, Union of South Africa, New Caledonia, Phillippine Islands, Turkey, Greece, and India, totaled 317,511 long tons, valued at $3,814,944 for 1939, compared with 352,085 long tons valued at $4,854,892 for 1938.

Total Chromite Production of California.

Production of chromite in California began, apparently in the period 1869-1873 in Del Norte County, followed by San Luis Obispo in 1874. There was considerable activity in San Luis Obispo from 1880 to 1883, inclusive, and a total of 23,238 long tons (or 26,028 short tons) valued at $329,924 was shipped from that county up to the beginning of 1887. There are records of shipments from Sonoma County (before 1883), Placer County (1883 and 1884), and Calaveras County. Apparently the state's total in the period 1869-1883 was some 45,000 tons.[2] The tabulation herewith shows the output of chromite in California annually, including the earliest figures so far as they are available. The figures from 1887 to date are from the records of the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1869-1883 Del Norte County, Sonoma County, Placer County, Calaveras County	19,000	$239,400			
1874-1887 (San Luis Obispo County)	26,028	329,924	1913	1,180	$12,700
1887	3,000	40,000	1914	1,517	9,434
1888	1,500	20,000	1915	3,725	38,044
1889	2,000	30,000	1916	48,943	717,244
1890	3,599	53,985	1917	52,379	1,130,298
1891	1,372	20,580	1918	73,955	3,649,497
1892	1,500	22,500	1919	*4,314	97,164
1893	3,319	49,785	1920	1,770	43,031
1894	3,680	39,980	1921	347	6,870
1895	1,740	16,795	1922	379	6,334
1896	786	7,775	1923	84	1,658
1897			1924	350	6,700
1898			1925	191	3,712
1899			1926	393	7,063
1900	140	1,400	1927	225	5,063
1901	130	1,950	1928	729	15,179
1902	315	4,725	1929	327	5,025
1903	150	2,250	1930	84	1,905
1904	123	1,845	1931	441	6,737
1905	40	600	1932, 1933 [a]	1,206	16,587
1906	317	2,859	1934	294	3,498
1907	302	6,040	1935	488	6,111
1908	350	6,195	1936	221	3,314
1909	436	5,309	1937	1,918	20,830
1910	749	9,707	1938	982	10,864
1911	935	14,197	1939	3,936	52,673
1912	1,270	11,260			
			Totals	273,161	$6,817,146

* Recalculated to 45% Cr_2O_3 beginning with 1919.

[a] Included under 'Unapportioned.'

[1] U. S. Bureau of Foreign and Domestic Commerce, Monthly Summary of Foreign Commerce to the United States, Dec. 1939.

[2] Day, D. T., Mineral Res. of the U. S. 1883-1884, U. S. G. S., pp. 569, 570, 1885.

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COBALT

Bibliography: Report XIV, XXXIII, XXXIV. Bulletins 67, 91. U. S. G. S., Min. Res. of U. S., 1912, 1918. U. S. B. M., I. C. 6331.

Occurrences of some of the cobalt minerals have been noted in several localities in California, but to date no commercial production has resulted. Some of the copper ores of the foothill copper belt in Mariposa and Madera counties have been found to contain cobalt up to 3%.

The nominal quotation for cobalt (May 16, 1940) is around 97 to 99% at $2.11 per pound for the refined metal.

The most important use of cobalt is in the manufacture of the alloy, stellite, in which it is combined with chromium, for making high-speed lathe tools, and non-tarnishing cutlery and surgeons' appliances. The metal is also used in electroplating, similarly to nickel; and the oxide, carbonate, chloride, sulphate and other salts are used in ceramics for coloring. Some of the organic salts of cobalt (acetate, resinate, oleate) are employed as 'driers' in paint and varnish.

COPPER

Bibliography: State Mineralogist Reports VIII-XXXV (inc.). Bulletins 23, 50, 91.

The total output of copper in California during 1939 amounted to 8,390,215 pounds of recoverable metal valued at $872,582. This was an increase in amount and value as compared with the 1938 production which was 1,613,491 pounds worth $158,122. The average price of copper in 1939 was 10.4¢ per pound compared with 9.8¢ in 1938; 12.1¢ in 1937; 9.2¢ in 1936; 8.3¢ in 1935; 8.0¢ in 1934; and 6.4¢ in 1933.

Copper was second to gold among the metals in California from 1896 to 1932, when it was passed in output by quicksilver and silver, and in 1933 also by tungsten, in 1936 and 1937 by silver only, and in 1938 and 1939 by silver, quicksilver and tungsten.

Distribution of the 1939 output of copper in California by counties was as follows:

County	Pounds	Value
Amador	3,933	$409
Butte	5,838	607
El Dorado	10,910	1,135
Imperial	67,328	7,002
Inyo	74,543	7,752
Kern	3,238	337
Los Angeles	2,936	305
Mariposa	3,810	396
Napa	9,667	1,005
Nevada	27,113	2,820
Placer	5,719	595
Plumas	8,051,386	837,344
Riverside	68,683	7,143
San Bernardino	43,133	4,486
Tuolumne	9,860	1,025
Alpine, Calaveras, Modoc, Orange, Shasta, Sierra and Trinity*	2,118	221
Totals	8,390,215	$872,582

* Combined to conceal the output of individual producers in each.

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According to preliminary data issued by the U. S. Bureau of Mines[1] the smelter production of primary copper from domestic sources during 1939 amounted to 1,425,349,488 pounds, an increase of approximately 27 per cent compared with the 1938 output. The value decreased approximately 34 per cent in 1939. The average price of copper delivered during the year, as reported to the U. S. Bureau of Mines by selling agents, was 10.4¢ per pound.

Copper Production of California, by Years.

Although some mining of copper ores in a small way had been done earlier, shipments in appreciable quantities began in 1861 and continued of importance up to the end of 1867, when a total of 68,631 tons (of 2376 pounds) of high-grade ores, and 847 tons of matte or 'regulus'[2] had been shipped to smelters at New York, Boston, and Swansea, Wales. The most important district at that time was Copperopolis and vicinity in Calaveras County, with some shipments also made from Mariposa, El Dorado, Fresno and San Luis Obispo counties. From 1868 to 1882, the output was insignificant. There are wide discrepancies in the figures recorded for copper production previous to 1882, in which year the data of the U. S. Geological Survey began. The detailed statistics of the California State Mining Bureau began in the year 1894.

Amount and value of copper production in California annually since 1882 is given in the following tabulation:

Copper Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1882	826,695	$144,672	1911	36,838,024	$4,604,753
1883	1,600,862	265,743	1912	34,169,997	5,638,049
1884	876,166	120,911	1913	34,471,118	5,343,023
1885	469,028	49,248	1914	30,491,535	4,055,375
1886	430,210	43,021	1915	40,968,966	7,169,567
1887	1,600,000	192,000	1916	55,809,019	13,729,017
1888	1,570,021	235,303	1917	48,534,611	13,249,948
1889	151,505	18,180	1918	47,793,046	11,805,883
1890	23,347	3,502	1919	22,162,605	4,122,246
1891	3,397,405	424,675	1920	12,947,299	2,382,303
1892	2,980,944	342,808	1921	12,088,053	1,559,358
1893	239,682	21,571	1922	22,883,987	3,090,582
1894	738,594	72,486	1923	28,346,860	4,166,989
1895	225,650	21,901	1924	52,089,349	6,823,704
1896	1,992,844	199,599	1925	46,968,499	6,669,527
1897	13,638,626	1,540,666	1926	33,521,544	4,693,014
1898	21,543,229	2,475,168	1927	27,350,316	3,582,888
1899	23,915,486	3,990,534	1928	25,162,304	3,623,360
1900	29,515,512	4,748,242	1929	33,809,258	5,941,799
1901	34,931,788	5,501,782	1930	26,534,752	3,449,522
1902	27,860,162	3,239,975	1931	12,954,842	1,178,890
1903	19,113,861	2,520,997	1932	1,417,536	89,307
1904	29,974,154	3,969,995	1933	992,515	63,521
1905	16,997,489	2,650,605	1934	590,638	47,252
1906	28,726,448	5,522,712	1935	2,031,836	168,645
1907	32,602,945	6,341,387	1936	9,991,799	919,245
1908	40,868,772	5,350,777	1937	10,512,500	1,272,013
1909	65,727,736	8,478,142	1938	1,613,491	158,122
1910	53,721,032	6,680,641	1939	8,390,215	872,582
			Totals	1,177,595,707	$185,637,647

[1] U. S. Bureau of Mines Mineral Market Report M. M. S. 829, May 7, 1940.
[2] Browne, J. Ross, Mineral Resources West of the Rocky Mountains, p. 168, 1867.

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GOLD

Bibliography: State Mineralogist Reports I to XXXV (inc.), (except III and VIII). Bulletins 36, 45, 57, 91, 92, 95, 108. U. S. Geol. Surv., Prof. Paper 73. U. S. Bur. of Mines, Econ. Paper 3 (1929).

Gold was first, and, for many years, the most important single mineral product of California. Although now surpassed for a number of years in annual value by petroleum, and by natural gas from 1923 to 1932, it still heads our metal list, and California continues to outrank all the other gold-producing States of the United States, including Alaska. In fact, at present, California is producing approximately 31% of the gold mined in the entire United States.

There has been a steady increase in the development of both lode and placer mines in California during the last ten years, brought about by the present economic conditions. During 1939 there were 1777 operators in California, not including snipers, prospectors and

Photo by R. K. Voorhies

600-ton sand leaching plant, Santa Fe Mine, San Bernardino County

various individuals, selling gold in small lots to the bullion dealers. There was no premium paid on gold during 1932, the price being $20.67 a fine ounce. On August 29, 1933, there was an executive order lifting the embargo on gold ores, concentrates, precipitates, and unretorted amalgam, followed on October 25, 1933, by another order instructing the Reconstruction Finance Corporation to buy newly-mined gold at a price fixed by the U. S. Treasurer which corresponded to the world price, all of which had an effect on the 1933 gold yield. On January 30, 1934, the Gold Reserve Act of 1934 was passed, followed by the President's proclamation of January 31, 1934, which fixed the weight of the gold dollar at 15 5/21 grains, nine-tenths fine. The value of gold thereby became $35 a fine ounce. The average weighted value of gold per fine ounce in 1934 was $34.95.

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The production of gold in California during 1939 totaled 1,435,264 fine ounces valued at $50,234,240, being an increase of 124,135 fine ounces over the 1938 yield which was 1,311,129 fine ounces worth $45,889,515. Deep or lode mines accounted for 799,219 fine ounces worth $27,972,665; and placers (mainly bucket-line, dragline and power shovels dredges) produced 636,045 fine ounces worth $22,261,575. The 1939 output was the largest in value since 1856 and in amount since 1862 with that of lode being undoubtedly the largest in the history of the State.

As the Division of Mines has never independently gathered the statistics of gold and silver production, these figures, as in former years, are published by cooperation with and through the courtesy of Charles White Merrill and H. M. Gaylord of the Division of Mineral Statistics, U. S. Bureau of Mines.

Distribution for the 1939 gold output by counties was as follows:

County	Mines producing[1]		Total	
	Lode	Placer	Fine ounces	Value
Alpine	4		49	$1,715
Amador	22	34	119,058	4,167,030
Butte	18	41	59,810	2,079,385
Calaveras	37	68	105,997	3,709,895
Colusa	1		1	35
Del Norte		4	126	4,410
El Dorado	62	31	72,003	2,520,105
Fresno	3	3	460	16,100
Humboldt	1	9	1,313	45,955
Imperial	16	3	19,657	687,995
Inyo	85	10	12,665	443,275
Kern	141	9	90,029	3,151,015
Lassen	7		95	3,325
Los Angeles	11	8	4,584	160,440
Madera	14	19	861	30,135
Mariposa	85	21	37,033	1,296,155
Merced		6	50,895	1,781,325
Modoc	1		7	245
Mono	24	2	6,337	221,795
Napa	1		3,306	115,710
Nevada	42	35	318,733	11,155,655
Placer	28	75	43,827	1,533,945
Plumas	25	44	36,181	1,266,335
Riverside	44	5	2,697	94,395
Sacramento	2	15	154,141	5,394,935
San Bernardino	135	18	10,652	372,820
San Diego	8		418	14,630
San Francisco		[3]	224	7,840
San Joaquin		4	1,891	66,185
San Luis Obispo		2	14	490
Santa Cruz		1	2	70
Shasta	26	42	44,766	1,566,810
Sierra	21	42	24,698	864,430
Siskiyou	63	76	48,824	1,708,840
Stanislaus		9	21,791	762,685
Tehama		2	905	31,675
Trinity	27	70	42,530	1,488,550
Tulare	3	2	93	3,255
Tuolumne	57	15	12,064	422,240
Yuba	11	22	86,799	3,037,965
Monterey, Orange and Ventura[2]	3	2	127	4,445
Totals	1,028	749	1,435,264	$50,234,240

[1] Excludes itinerant prospectors, snipers, high-graders, and others who gave no evidence of legal right to property.
[2] Combined to avoid disclosure of individual output.
[3] Output from property not classed as a "mine."

The largest production of gold by counties was reported by Nevada County with an output of 318,733 fine ounces ($11,155,655); followed by Sacramento County second with 154,141 fine ounces ($5,394,935); Amador County third with 119,058 fine ounces ($4,167,-

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030); Calaveras County fourth with 105,997 fine ounces ($3,709,895); Kern County fifth with 90,029 fine ounces ($3,151,015); Yuba County sixth with 86,799 fine ounces ($3,037,965); followed in turn by El Dorado, Merced, Siskiyou, Shasta, Placer, Trinity, and Mariposa counties all with a total gold output in excess of a million dollars.

Nevada held the first place as a gold producing county with an output exceeding that of Yuba or Amador which held first and second places respectively in 1928 with Sacramento fourth that year. Sacramento was in second place, exceeding Amador County, which held this place in 1937. The gold from Nevada, Amador and Kern counties is mainly from the lode or deep mines; while that from Sacramento and Yuba counties is almost entirely from dredges and that from Calaveras County is about equally divided between lode mines and dredges.

The following is quoted from the advance statement of gold in 1939 by courtesy of the U. S. Bureau of Mines,* Department of Commerce:

"*Gold.* Since 1929, when the value of California gold output reached a low of $8,526,703, production has expanded almost six-fold; the gain in 1939 over 1938 alone was more than half the total value of the output in 1929. In quantity the 1939 gold output was greater than in any year since 1862, and in value it was greater than in any year since 1856. During the last three years the following percentage gains have been registered over the respective preceding years: 1939, 9 per cent; 1938, 12 per cent; and 1937, 9 per cent. Thus, a 10 per cent per annum increase has been sustained over the period.

"Although data for gold production in California before 1901 do not segregate placer and lode gold, it appears certain that the output of lode gold was larger in 1939 in both quantity and value than in any year in the history of the State. The quantity and value of placer gold produced are known to be higher in 1939 than in any year since 1900. Moreover, the value of placer gold in 1939 exceeds the value of lode and placer gold combined for any year from 1865 to 1882 and from 1884 to 1900.

"The 25 leading California gold properties, listed in the following table, produced 54 per cent of the total gold output of the State in 1939. Newcomers to the list in 1939 were six lode mines which displaced four connected-bucket dredges and two lode mines. All of the newcomers had had substantial output in 1938 except the Alhambra Shumway which started production March 14, 1939, after a long exploration campaign. Of the leading producers, 16 derived their gold from gold ore, seven from dredging gravel, and one each from gold-silver ore and copper ore. The producers ranking first, second, and sixth are in the Grass Valley-Nevada City district, Nevada County."

* U. S. Bureau of Mines, Mineral Year Book, 1940, pp. 209-210.

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Twenty-five Leading Gold Producers in California in 1939, in Approximate Order of Output

Rank	Mine	District	County	Rank in 1938	Operator	Source of Gold
1	Idaho Maryland	Grass Valley-Nevada City	Nevada	2	Idaho Maryland Mines Corp.	Gold ore
2	Empire Star Mines	Grass Valley-Nevada City	Nevada	1	Empire Star Mines Co., Ltd.	Gold ore
3	Natomas Co.	Folsom	Sacramento	3	Natomas Co.	Dredge
4	Yuba Unit	Yuba River	Yuba	4	Yuba Consolidated Gold Fields	Dredge
5	Central Eureka and Old Eureka	Mother Lode	Amador	7	Central Eureka Mining Co.	Gold ore
6	Lava Cap	Grass Valley-Nevada City	Nevada	6	Lava Cap Gold Mining Corp.	Gold ore
7	Capital Dredges	Folsom	Sacramento	5	Capital Dredging Co.	Dredge
8	Carson Hill	Mother Lode	Calaveras	8	Carson Hill Gold Mining Corp.	Gold ore
9	Golden Queen	Mojave	Kern	9	Golden Queen Mining Co.	Gold ore
10	Argonaut	Mother Lode	Amador	17	Argonaut Mining Co., Ltd.	Gold ore
11	Butte Unit	Oroville	Butte	22	Yuba Cons. Gold Fields	Dredge
12	Alhambra-Shumway[1]	Mother Lode	El Dorado	(1)	Alhambra-Shuway Mines, Inc.	Gold ore
13	Yellow Aster	Randsburg	Kern	15	Anglo-American Mining Corp., Ltd.	Gold ore
14	Snelling	Snelling	Merced	12	Snelling Gold Dredging Co.	Dredge
15	Iron Mountain	Iron Mountain	Shasta	13	The Mountain Copper Co., Ltd.	Gold ore
16	Merced Unit	Snelling	Merced	10	Yuba Cons. Gold Fields	Dredge
17	Ohio Point	Rich Bar	Plumas	32	Virgilia Mining Corp.	Gold ore
18	Sheepranch	East Belt	Calaveras	16	St. Joseph Lead Co.	Gold ore
19	Sliger	Mother Lode	El Dorado	66	Middle Fork Gold Mining Co.	Gold ore
20	Alabama	Ophir	Placer	30	Alabama California Gold Mines Co.	Gold ore
21	Cactus Queen	Mojave	Kern	11	Cactus Mines Co.	Gold-silver ore
22	Walker	Genessee	Plumas	100	Walker Mining Co.	Copper ore
23	Starlight	Mojave	Kern	21	Lodestar Mining Co.	Gold ore
24	Cargo Muchacho	Cargo Muchacho	Imperial	134	Holmes & Nicholson Mining & Milling Co.	Gold ore
25	San Joaquin Dredge	Snelling	Merced	23	San Joaquin Mining Co.	Dredge

[1] Production started March 14, 1939.

Total Gold Production of California.

The presence of gold in stream gravels near Los Angeles was known and worked in a small way by the Indians, at least as early as 1841,[1] and possibly 1820.[2] On March 2, 1844, Don Manuel Castanares, deputy for California to the Congress of Mexico, reported [3] to his government that placers near Los Angeles had produced up to December, 1843, a total of 2000 ounces of gold dust, most of which had been sent to the United States Mint at Philadelphia.

As the padres and the rancheros discouraged the quest of gold, this early, small production caused no particular excitement. It was not until James W. Marshall's finding of gold nuggets in the tail-race of Sutter's saw mill on the American River, January 24, 1848, was heralded abroad that the great rush began, and California became a commonwealth of first rank almost over night. There are, however, no authentic data on gold production prior to 1848, other than occasional, scattered references such as above quoted.

The following table was originally compiled by Chas. G. Yale, of the Division of Mineral Resources, U. S. Geological Survey, but for a number of years statistician of the California State Mining Bureau

[1] Hittell, T. H., History of California, Vol. II, p. 12, 1885.
[2] Bancroft, H. H., History of California, Vol. II, p. 417, 1886.
[3] Mercantile Trust Review of the Pacific, Vol. XIV, No. 2, p. 43, Feb. 15, 1925.

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and the U. S. Mint at San Francisco. The authorities chosen for certain periods were: J. D. Whitney, State Geologist of California; John Arthur Phillips, author of "Mining and Metallurgy of Gold and Silver" (1867); U. S. Mining Commissioner R. W. Raymond; U. S. Mining Commissioner J. Ross Browne; Wm. P. Blake, Commissioner from California to the Paris Exposition, where he made a report on "Precious Metals" (1867); John J. Valentine, author for many years of the annual report on precious metals published by Wells, Fargo & Company's Express; and Louis A. Garnett, in the early days manager of the San Francisco refinery, where records of gold receipts and shipments were kept. Mr. Yale obtained other data from the reports of the director of the U. S. Mint and the director of the U. S. Geological Survey. The authorities referred to who were alive at the time of the original compilation of this table in 1894 were all consulted in person or by letter by Mr. Yale with reference to the correctness of their published data, and the final table quoted was then made up.

The figures for 1903-1923 (inclusive) are those prepared by the U. S. Geological Survey; and since by the U. S. Bureau of Mines:

Total Gold Production of California, 1848 to 1938

Year	Fine ounces	Value	Year	Fine ounces	Value
1848	11,866	$245,301	1895	741,798	$15,334,317
1849	491,072	10,151,360	1896	831,158	17,181,562
1850	1,996,586	41,273,106	1897	767,779	15,871,401
1851	3,673,512	75,938,232	1898	769,476	15,906,478
1852	3,932,631	81,294,700	1899	741,881	15,336,031
1853	3,270,803	67,613,487	1900	767,390	15,863,355
1854	3,358,867	69,433,931	1901	821,845	16,989,044
1855	2,684,106	55,485,395	1902	818,037	16,910,320
1856	2,782,018	57,509,411	1903	788,544	16,300,653
1857	2,110,513	43,628,172	1904	901,484	18,633,676
1858	2,253,846	46,591,140	1905	914,217	18,898,545
1859	2,217,829	45,846,599	1906	906,182	18,732,452
1860	2,133,104	44,095,163	1907	809,214	16,727,928
1861	2,026,187	41,884,995	1908	907,590	18,761,559
1862	1,879,595	38,854,668	1909	979,007	20,237,870
1863	1,136,897	23,501,736	1910	953,734	19,715,440
1864	1,164,455	24,071,423	1911	954,870	19,738,908
1865	867,405	17,930,858	1912	953,640	19,713,478
1866	828,367	17,123,867	1913	987,187	20,406,958
1867	883,591	18,265,452	1914	999,113	20,653,496
1868	849,265	17,555,867	1915	1,085,646	22,442,296
1869	881,830	18,229,044	1916	1,035,745	21,410,741
1870	844,537	17,458,133	1917	971,733	20,087,504
1871	845,493	17,477,885	1918	799,588	16,528,953
1872	748,951	15,482,194	1919	807,667	16,695,955
1873	726,554	15,019,210	1920	692,297	14,311,043
1874	835,186	17,264,836	1921	759,721	15,704,822
1875	816,377	16,876,009	1922	709,678	14,670,346
1876	755,169	15,610,723	1923	647,210	13,379,013
1877	798,249	16,501,268	1924	636,140	13,150,175
1878	911,343	18,839,141	1925	632,035	13,065,330
1879	949,439	19,626,654	1926	576,798	11,923,481
1880	968,986	20,030,761	1927	564,586	11,671,018
1881	929,920	19,223,155	1928	521,740	10,785,315
1882	829,458	17,146,416	1929	412,479	8,526,703
1883	1,176,329	24,316,873	1930	457,200	9,451,162
1884	657,900	13,600,000	1931	523,135	10,814,162
1885	612,478	12,661,044	1932	569,167	11,765,726
1886	711,911	14,716,506	1933	[a]613,579	15,683,075
1887	657,349	13,588,614	1934	[b]719,064	25,131,284
1888	616,000	12,750,000	1935	[c]890,430	31,165,050
1889	542,425	11,212,913	1936	1,077,442	37,710,470
1890	595,486	12,309,793	1937	1,174,578	41,110,230
1891	615,759	12,728,869	1938	1,311,129	45,889,515
1892	608,166	12,571,900	1939	1,435,264	50,234,240
1893	606,564	12,538,780			
1894	670,636	13,863,282	Totals	97,403,207	$2,111,159,946

[a] Value calculated at an average weighted price of $25.56 per fine ounce; previously $20.6718.
[b] Value calculated at an average weighted price of $34.95 per fine ounce.
[c] Value $35 per fine ounce, beginning 1935.

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IRIDIUM (see under Platinum)

IRON ORE

Bibliography: State Mineralogist Reports II, IV, V, X, XII-XV (inc.), XVII, XVIII, XXI-XXVII (inc.), XXX, XXXI, XXXIII-XXXV (inc.). Bulletins 38, 67, 91. Am. Inst. Min. Eng., Trans. LIII. Min. & Sci. Press, Vol. 115, pp. 112, 117-122; Vol. 123, pp. 94-96, 113-114.

During 1939 shipments of iron ore in California amounting to 16,990 short tons valued at $77,788 coming from a single property in each of the counties of Inyo, San Bernardino, and Santa Cruz. The 1939 output showed a decrease in amount and value from that of 1938 which was 27,878 tons worth $141,406.

The material mined during the year was hematite from Inyo and San Bernardino counties, and magnetite sands from Santa Cruz County. The hematite was used mostly in high-iron cement with some going to foundries as a flux.

There was also some high-grade limonite mined in Yuba County, but as it was used in the manufacture of pigments, it has been classed under Mineral Paints.

There are considerable deposits of iron ore known in California, notably in Shasta, Madera, Placer, Riverside, San Bernardino, and Los Angeles counties, but production has so far been limited for lack of an economic supply of coking coal. Some pig iron has been made, utilizing charcoal for fuel, both in blast furnaces and by electrical reduction; also, ferrochrome, ferromanganese, and ferrosilicon have been made in California.

Iron Ore Production in California, by Years.

Total iron ore production of California, with annual amounts and values, is as follows:

Year	Tons	Value	Year	Tons	Value
1881*	9,273	$79,452	1918	3,108	$15,947
1882	2,073	17,766	1919	2,300	13,796
1883	11,191	106,540	1920	5,975	40,889
1884	4,532	40,983	1921	1,970	12,030
1885			1922	3,588	18,868
1886	3,676	19,250	1923	3,102	18,665
1887			1924		
1893	250	2,000	1925	785	4,710
1894	200	1,500	1926		
1895			1927	5,272	26,000
1907	400	400	1928		
1908			1930		
1909	108	174	1931	100	700
1910	579	900	1932		
1911	558	558	1934		
1912	2,508	2,508	1935	38,339	163,714
1913	2,343	4,485	1936	31,084	155,434
1914	1,436	5,128	1937	5,490	29,340
1915	724	2,584	1938	27,878	141,406
1916	3,000	6,000	1939	16,990	77,788
1917	2,874	11,496			
			Totals	191,586	$1,121,011

* Productions for the years 1881-1886 (inc.) were reported as "tons of pig iron" (U.S.G.S., Min. Res. 1885), and for the table herewith are calculated to "tons of ore" on the basis of 47.6% Fe as shown by an average of analyses of the ores (State Mineralogist Report IV, p. 242). This early production of pig iron was from the blast furnaces then in operation at Hotaling in Placer County. Charcoal was used in lieu of coke. Though producing a superior grade of metal, they were obliged finally to close down, as they could not compete with the cheaper English and eastern United States iron brought in by sea to San Francisco.

[a] Annual details concealed under 'Unapportioned.'

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LEAD

Bibliography: State Mineralogist Reports IV, VIII-XV (inc.), XVII-XXVIII (inc.), XXX, XXXI, XXXIII-XXXV (inc.).

The production of lead in California during 1939 amounted to a total of 1,061,294 pounds of recoverable metal valued at $49,880, compared with the 1938 figures of 1,003,096 pounds of $46,142. The average price of lead in 1939 was 4.7¢ per pound compared with 4.6¢ per pound in 1938; 5.9¢ per pound in 1937; 4.6¢ in 1936; 4.0¢ in 1935; and 3.7¢ in 1934.

Distribution of the 1939 output of lead by counties was as follows:

County	Pounds	Value
Amador	1,565	$49
Butte	11,799	555
Calaveras	1,651	78
El Dorado	4,766	224
Imperial	1,598	75
Inyo	174,407	8,197
Kern	28,542	1,341
Los Angeles	2,183	103
Mariposa	50,357	2,367
Nevada	39,921	1,876
Placer	26,409	1,241
Riverside	634,071	29,801
San Bernardino	62,389	2,932
Shasta	3,790	178
Sierra	4,752	223
Alpine, Orange, Plumas, Tuolumne*	13,094	640
Totals	1,061,294	$49,880

* Combined to conceal the output of individual operators in each.

Lead Production of the United States.

According to preliminary data issued by the U. S. Bureau of Mines[1] during 1939, the production of primary lead in the United States was 420,967 short tons valued at $39,571,000, being an increase from the national production of 1938, which was 331,964 short tons worth $30,541,000.

[1] U. S. Bureau of Mines, Mineral Market Notes 814, April 5, 1940.

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Lead Production of California, by Years.

Statistics on lead production in California were first compiled by this Bureau in 1887. Amount and value of the output, annually, with total figures, to date, are given in the following table:

Lead Production of California, by Years

Year	Pounds	Value	Year	Pounds	Value
1877	[a]7,836,000	$391,800	1909	2,685,477	$144,897
1878	8,640,000	328,320	1910	3,016,902	134,082
1879	4,502,000	191,335	1911	1,403,839	63,173
1880	4,200,000	215,460	1912	1,370,067	61,653
1881	6,680,000	325,316	1913	3,640,951	160,202
1882	[b]4,000,000	196,800	1914	4,697,400	183,198
1883	[c]3,400,000	145,520	1915	4,796,299	225,426
1884	3,200,000	120,512	1916	12,392,031	855,049
1885	2,000,000	80,900	1917	21,651,352	1,862,016
1886	2,000,000	93,400	1918	13,464,869	956,006
1887	[d]1,160,000	52,200	1919	4,139,562	219,397
1888	900,000	38,250	1920	4,903,738	392,300
1889	940,000	35,720	1921	1,149,051	51,707
1890	800,000	36,000	1922	6,511,280	358,120
1891	1,140,000	49,020	1923	9,934,522	695,416
1892	1,360,000	54,400	1924	4,984,387	398,751
1893	666,000	24,975	1925	7,352,422	639,661
1894	950,000	28,500	1926	8,067,873	645,429
1895	1,592,400	49,364	1927	2,748,440	173,151
1896	1,293,500	38,805	1928	1,882,795	109,102
1897	596,000	20,264	1929	1,428,777	90,014
1898	655,000	23,907	1930	3,542,796	176,241
1899	721,000	30,642	1931	3,934,240	145,568
1900	1,040,000	41,600	1932	2,418,626	72,480
1901	720,500	28,820	1933	772,463	28,583
1902	349,440	12,230	1934	804,911	29,655
1903	110,000	3,960	1935	1,142,405	45,695
1904	124,000	5,270	1936	1,098,545	50,533
1905	533,680	25,083	1937	2,402,110	141,724
1906	338,718	19,307	1938	1,003,096	46,142
1907	328,681	16,690	1939	1,061,294	40,880
1908	1,124,483	46,663	Totals	204,303,922	$11,867,284

[a] Quantities for 1877-1881 (inc.) from C. E. Siebenthal, Mineral Resources of U. S. 1912, Part I, U. S. Geol. Survey, p. 339; and values for same years from quotations in Eng. & Min. Jour. of New York.
[b] Estimated.
[c] Quantities and values for 1883-1886 (inc.) from Mineral Resources of U. S. Geol. Surv., 1883-1886, respectively.
[d] Data from 1887 to date from reports of California State Mining Bureau.

MANGANESE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVIII, XXII-XXVII (inc.), XXIX-XXXI, XXXIII-XXXV (inc.). Bulletins 38, 67, 76, 91. U. S. G. S. Bull. 427. Eng. & Min. Jour.-Press, Vol. 117, p. 545.

A sample shipment of manganese concentrates assaying 50% Manganese was made from Imperial County during 1939, and was the first output since 1935. The material mined in 1935 came from a single property in Riverside County and was consumed in the steel mills of the state. The annual details are concealed under the 'Unapportioned' item as one operator made all the shipments.

Imports of foreign manganese ore into the United States[1] during 1939, mainly from Soviet Russia, Gold Coast, Cuba and Brazil, amounted to 657,813 long tons of ore containing 322,708 long tons of manganese valued at $8,628,059, as compared iwth 513,637 long tons of ore containing 242,857 long tons of manganese valued at $7,046,827.

[1] U. S. Bureau of Foreign and Domestic Commerce, Monthly Summary, December, 1939.

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The Tariff Act of 1930 provides for an import duty of 1¢ per pound on the metallic manganese contained, for "manganese ore (including ferruginous manganese ore) or concentrates containing in excess of 10 per centum of metallic manganese."

Manganese Ore Production in California, by Years.

Production of manganese ore in California began at the Ladd Mine, San Joaquin County, in the Tesla District in 1867. When shipments of this ore to England ceased late in 1874, upwards of 5000 tons had been produced by that property. For some years following that, the output was small. The tabulation herewith shows California's output of manganese ore, annually, since 1887, when the compilation of such figures was begun by the State Mining Bureau:

Year	Tons	Value	Year	Tons	Value
1887	1,000	$9,000	1912	22	$400
1888	1,500	13,500	1913		
1889	53	901	1914	150	1,500
1890	386	3,176	1915	4,013	49,088
1891	705	3,830	1916	13,404	274,601
1892	300	3,000	1917	15,515	396,659
1893	270	4,050	1918	26,075	979,235
1894	523	5,512	1919	11,569	451,422
1895	880	8,200	1920	2,892	62,323
1896	518	3,415	1921	1,005	12,210
1897	504	4,080	1922	540	7,650
1898	440	2,102	1923	690	10,620
1899	295	3,165	1924	1,115	25,785
1900	131	1,310	1925	832	19,450
1901	425	4,405	1926	235	4,700
1902	870	7,140	1927		
1903	1	25	1928		
1904	60	900	1929	733	8,216
1905			1930		
1906	1	30	1931	207	2,576
1907	1	25	1932		
1908	321	5,785	1934		
1909	3	75	1935	432	4,630
1910	265	4,235	1936		
1911	2	40	1939	*	*
			Totals	88,883	$2,298,976

*Annual details concealed under 'Unapportioned.'

MOLYBDENUM

Bibliography: State Mineralogist Reports XIV, XVII-XXIV (inc.), XXVI-XXVIII (inc.), XXX, XXXIV, XXXV. Bulletins 67, 91. U. S. Bur. of Min., Bulletin 111. Proc. Colo. Sci. Soc., Vol. XI.

Molybdenum is used as an alloy constituent in the steel industry, and in certain forms of electrical apparatus. Included in the latter is its successful substitution for platinum and platinum-iridium in electric contact-making and -breaking devices. In alloys it is used similarly to and in conjunction with chromium, cobalt, iron, manganese, nickel, tungsten and vanadium. The oxides and the ammonium salt have important chemical uses.

The two principal molybdenum minerals are: the sulphide, molybdenite, and wulfenite, lead molybdate; the former furnishing practically the entire commercial output. Molybdenite is found in or associated with acidic igneous rocks, such as granite and pegmatite.

Deposits of disseminated molybdenite are known in several localities in California, and in at least two places it occurs in small masses

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associated with copper sulphides. The first recorded commercial shipments of molybdenum ore in California were during the war, 1916-1918. Some development work has been done on a high-grade deposit at the head of the Kaweah River, Tulare County.

The growing consumption of molybdenum by alloy-steel makers in the United States has been stimulated by the fact that molybdenum alone of the steel-alloying metals can be produced commercially in the United States to an extent which avoids all necessity for importation. Another fact has been the marked adaptability of molybdenum steels to large-scale production of automobile and other parts.

The Tariff Act of 1930 provides for an import duty of 35 cents a pound for the metallic molybdenum content of molybdenum ores or concentrates.

The present (May 2, 1940) quotations on molybdenum ores are 45¢ per pound of MoS_2 contained, f.o.b. mine, and on ferromolybdenum are 95¢ per pound Mo, 55%-65% Mo f.o.b. shipping point.

During 1939 there were shipments of molybdenum concentrates in California coming from a tungsten mine in Inyo County, the amount of which was greater than the total of all previous production. In 1933 and 1934 there were shipments of molybdenum concentrates in California amounting to 1432 pounds 91.23% MoS_2 valued at $306. The annual details are combined under the 'Unapportioned' item to conceal the output of a single operator.

Molybdenum Production of California, by years.

California's production of molybdenum ore by years is summarized in the following tabulation:

Year	Pounds of MoS_2	Value
1916	9,280	$9,945
1917	7,290	9,014
1918	----	----
1919	270	300
1933 } 1934 } [a]	1,306	306
1939	[a]	[a]
Totals	18,146	$19,565

[a] Annual details concealed under 'Unapportioned.'

NICKEL

Bibliography: State Mineralogist Reports XIV, XVII, XXIV, XXV, XXVIII, XXX, XXXIV, XXXV. U. S. G. S., Bulletin 640-D. U. S. Bureau of Standards, Circular 100.

Nickel occurs in the Friday Copper Mine in the Julian District, San Diego County. The ore is a nickel-bearing pyrrhotite, with some associated chalcopyrite. Some ore has been mined in the course of development work but not treated nor disposed of, as they were unable to get any smelter to handle it for them. Nickel ore has also been reported from other localities in California, but not yet confirmed.

Present (May 2, 1940) quotations for nickel are around 35¢ per pound for the refined metal.

OSMIUM (see under Platinum)

PALLADIUM (see under Platinum)

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PLATINUM GROUP METALS

Bibliography: State Mineralogist Reports IV, VIII, IX, XII-XXVI (inc.), XXVIII, XXX, XXXI, XXXIV-XXXV. Bulletins 38, 45, 67, 85, 91, 92. U. S. Geol. Surv., Bulletins 193, 285. Trans. Am. Inst. Min. Eng., Vol. 47, pp. 217-218.

In California the platinum-group metals are obtained as a by-product from placer operations for gold. The major portion of it comes from the dredges working in Amador, Butte, Merced, Sacramento, Stanislaus, Shasta, Trinity and Yuba counties, with a small amount coming from the hydraulic and surface sluicing mines of Del Norte, Humboldt, Siskiyou and Trinity counties.

Platinum-group metals mined during 1939 amounted to 1337 ounces crude of which 317 ounces were not sold. 1020 ounces crude were shipped and sold, containing 896.12 fine ounces worth $32,135. This metal came from properties in Amador, Butte, Calaveras, Del Norte, El Dorado, Humboldt, Merced, Placer, Plumas, Sacramento, San Francisco, Shasta, Siskiyou, Tehama, Trinity, Tuolumne and Yuba counties. Of the above metal sold in 1939, there was 337.82 fine ounces of platinum; 302.95 fine ounces of iridium; 198.81 fine ounces of osmium; 17.74 fine ounces of palladium; and 58.80 fine ounces were a mixture of ruthenium, rhodium, osmiridium, etc. The 1938 output was 1,194.40 ounces crude containing 1,069.36 fine ounces worth $35,150.

Present quotations[1] (May 2, 1940) are platinum $38.00 a fine ounce; iridium 99 per cent plus, $150; osmium per fine ounce, $50 to $55; palladium per fine ounce $24; ruthenium per fine ounce $35 to $40; rhodium per fine ounce $125.

Platinum Production of California, by Years.

The annual production and values since 1887 have been as follows:

Year	Ounces	Value	Year	Ounces	Value
1887	416	$10,400	1914	463	$14,816
1888	100	400	1915	667	21,149
1889	500	2,000	1916	886	42,642
1890	500	2,000	1917	610	43,719
1891	600	2,500	1918	571	42,788
1892	100	500	1919	*418	60,611
1893	80	440	1920	477	68,977
1894	75	517	1921	613	58,754
1895	100	600	1922	795	90,288
1896	150	900	1923	602	78,546
1897	162	944	1924	273	36,452
1898	150	900	1925	292	39,937
1899	300	1,800	1926	322	32,005
1900	300	1,800	1927	139	10,749
1901	400	2,500	1928	312	27,902
1902	250	3,200	1929	212	14,416
1903	39	468	1930	217	11,700
1904	70	1,052	1931	305	11,979
1905	123	1,849	1932	278	8,142
1906	200	3,320	1933	236	7,255
1907	91	1,647	1934	424	14,884
1908	300	6,255	1935	121	4,153
1909	706	13,414	1936	1,000	40,669
1910	337	8,386	1937	530	23,704
1911	511	14,873	1938	1,069	35,150
1912	603	19,731	1939	896	32,135
1913	368	17,738			
			Totals	20,253	$993,656

* Fine ounces, beginning with 1919.

[1] E. & M. J., Metal and Mineral Markets, May 2, 1940.

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QUICKSILVER

Bibliography: State Mineralogist Reports IV, V, XII-XV, XVII-XXIX (inc.), XXXI, XXXIII-XXXV (inc.). Bulletins 27, 78, 91. U. S. Geol. Surv., Monograph XIII. U. S. Bur. of Mines, Tech. Papers 96, 227; Bulletin 222, 335.

The production of quicksilver in California in 1939 amounted to 11,201 flasks valued at $1,102,563, compared with 12,171 flasks worth $846,497 in 1938. The 1939 output came from 78 properties in 18 counties and was distributed as follows:

County	Flasks	Value
Kings	25	$2,583
Lake	4,155	416,150
Monterey	11	1,151
Napa	691	71,823
San Benito	3,860	360,567
San Luis Obispo	276	26,587
Santa Barbara	74	6,876
Santa Clara	252	26,098
Sonoma	255	27,212
Contra Costa, Fresno, Inyo, Kern, Mono, Orange, Solano, Trinity, Yolo *	1,602	166,716
Totals	11,201	$1,105,563

* Combined to conceal output of a single operator in each.

During 1939 the average for New York monthly quotations [1] was $103.940 per 76 pound flask. The average New York price for 1938 was $75.469 per flask. The average quotation for January, 1939 was $77.440 per flask; with an unward trend till April when quotation reached $90.800, then dropped to $84.407 for August, and with the outbreak of the war in Europe quotations rose to an average of $140.00 for September, $145.60 for October, $134.978 for November and $141.-200 for December. In 1940 the price continued to rise and in June the average quotation was $197.36 per flask. The average amount received by producers in California during 1939 was $98.434 per 76 pound flask, compared with $69.55 per flask in 1938.

The U. S. Bureau of Mines [2] reported the total production of the United States for 1939 at 18,633 flasks valued at $1,936,714, compared with the national output of 17,991 flasks worth $1,357,781 for 1938. California was the largest producing state, by a considerable margin, with 60 per cent of the total, other producing states being Oregon, Nevada, Arizona, Arkansas, Idaho, and Texas.

The 1939 imports of quicksilver amounted to 3,499 flasks valued at $336,744 of which 2,601 flasks came from Spain, 562 flasks from Mexico, and 336 flasks from Italy. The 1938 imports totaled 2,362 flasks worth $132,610.

Total Quicksilver Production of California.

Total amount and value of the quicksilver production of California, as given in available records, are shown in the following tabulation. Though the New Almaden Mine in Santa Clara County was first worked in 1824, and was in practically continuous operation from 1846 to 1921 (the yield being small the first two years), there are no available data on the output earlier than 1850. Previous to June, 1904, a 'flask' of quicksilver contained 76½ pounds; then 75 pounds up to and includ-

[1] Engineering and Mining Journal, 1939, Vol. 140.
[2] U. S. Bureau of Mines, Mineral Report 833, May 20, 1940.

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Photo by Alfred L. Ransome

Sulphur Bank Quicksilver Mine (Parrot Pit), Lake County, Clear Lake in the background

ing 1927; beginning with 1928, 76 pounds. In compiling this table the following sources of information were used: for 1850–1883, table by J. B. Randol, in Report of State Mineralogist IV, p. 336; 1883–1893, U. S. Geological Survey reports; 1894 to date, statistical bulletins of the State Mining Bureau; also State Mining Bureau, Bulletin 27, "Quicksilver Resources of California," 1908, p. 10.

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Year	Flasks	Value	Average price per flask	Year	Flasks	Value	Average price per flask
1850	7,723	$768,052	$99 45	1896	30,765	$1,075,449	$34 96
1851	27,779	1,859,248	66 93	1897	26,691	993,445	37 28
1852	20,000	1,166,600	58 33	1898	31,092	1,188,626	38 23
1853	22,284	1,235,648	55 45	1899	29,454	1,405,045	47 70
1854	30,004	1,663,722	55 45	1900	26,317	1,182,786	44 94
1855	33,000	1,767,150	53 55	1901	26,720	1,285,014	48 46
1856	30,000	1,549,500	51 65	1902	29,552	1,276,524	43 20
1857	28,204	1,374,381	48 73	1903	32,094	1,335,954	42 25
1858	31,000	1,482,730	47 83	1904	[a]28,876	1,086,323	37 62
1859	13,000	820,690	63 13	1905	24,655	886,081	35 94
1860	10,000	535,500	53 55	1906	19,516	712,334	36 50
1861	35,000	1,471,750	42 05	1907	17,379	663,178	38 16
1862	42,000	1,526,700	36 35	1908	18,039	763,520	42 33
1863	40,531	1,705,544	42 08	1909	16,217	773,788	47 71
1864	47,489	2,179,745	45 90	1910	17,665	799,002	45 23
1865	53,000	2,432,700	45 90	1911	19,109	879,205	46 01
1866	46,550	2,473,202	53 13	1912	20,600	866,024	42 04
1867	47,000	2,157,300	45 90	1913	15,661	630,042	40 23
1868	47,728	2,190,715	45 90	1914	11,373	557,846	49 05
1869	33,811	1,551,925	45 90	1915	14,199	1,157,449	81 52
1870	30,077	1,725,818	57 38	1916	21,427	2,003,425	93 50
1871	31,686	1,999,387	63 10	1917	24,382	2,396,466	98 29
1872	31,621	2,084,773	65 93	1918	22,621	2,579,472	114 03
1873	27,642	2,220,482	80 33	1919	15,200	1,353,381	89 04
1874	27,756	2,919,376	105 18	1920	10,278	775,527	75 45
1875	50,250	4,228,538	84 15	1921	3,157	140,666	44 56
1876	75,074	3,303,256	44 00	1922	3,466	191,851	55 35
1877	79,396	2,961,471	37 30	1923	5,458	332,851	60 98
1878	63,880	2,101,652	32 90	1924	7,948	543,080	68 33
1879	73,684	2,194,674	29 85	1925	7,683	621,831	80 81
1880	59,926	1,857,706	31 00	1926	5,892	516,382	87 64
1881	60,851	1,815,185	29 83	1927	6,488	714,418	111 67
1882	52,732	1,488,624	28 23	1928	[b]7,107	844,649	118 84
1883	46,725	1,343,344	28 75	1929	10,152	1,195,705	117 78
1884	31,913	973,347	30 50	1930	11,374	1,255,257	110 36
1885	32,073	986,245	30 75	1931	13,478	1,121,624	83 22
1886	29,981	1,064,326	35 50	1932	5,349	279,780	52 30
1887	33,760	1,430,749	42 38	1933	4,102	229,472	55 94
1888	33,250	1,413,125	42 50	1934	7,946	534,135	67 22
1889	26,464	1,190,880	45 00	1935	9,353	628,590	67 23
1890	22,926	1,203,615	52 50	1936	8,758	671,055	76 62
1891	22,904	1,036,406	45 25	1937	9,995	837,789	83 82
1892	27,993	1,139,595	40 71	1938	12,171	846,497	69 55
1893	30,164	1,108,527	36 75	1939	11,201	1,105,563	98 43
1894	30,416	934,000	30 70				
1895	36,104	1,337,131	37 04	Totals	2,416,311	$119,212,135	

[a] Flasks of 75 lbs. from June, 1904; of 76½ lbs. previously.
[b] Flasks of 76 pounds, from January, 1928.

SILVER

Bibliography: State Mineralogist Reports IV, VIII, XII-XXXV (inc.). Bulletins 67, 91, 108. Min. & Sci. Press, March 1, 1919.

The 1939 silver output in California totaled 2,599,139 fine ounces valued at $1,764,264, being an increase in amount and value over the 1938 figures, which were 2,590,804 fine ounces worth $1,674,863. Of the 1939 yield there were 56,131 fine ounces valued at $38,101 from placers, the remainder from lode ores. The average price paid for newly mined domestic silver was 67.80¢ per fine ounce in 1939; 64.60¢ in 1938; 77.35¢ in 1937; 77.45¢ in 1936; 71.875¢ in 1935; and 64.60¢ in 1934.

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Silver production by counties for 1939 was as follows:

County	Ounces	Value
Alpine	4,489	$3,047
Amador	22,703	15,411
Butte	17,106	11,611
Calaveras	23,664	16,063
Del Norte	22	15
El Dorado	12,710	8,627
Fresno	85	58
Humboldt	166	113
Imperial	8,951	6,076
Inyo	30,104	20,434
Kern	1,130,888	767,633
Lassen	355	241
Los Angeles	967	656
Madera	267	181
Mariposa	19,418	13,181
Merced	4,743	3,219
Modoc	4	3
Mono	87,279	59,243
Monterey, Orange, and Ventura [1]	4,254	2,888
Napa	291,248	197,696
Nevada	410,826	278,864
Placer	54,235	36,814
Plumas	194,578	132,077
Riverside	17,095	11,604
Sacramento	7,519	5,104
San Bernardino	189,377	128,547
San Diego	245	166
San Francisco	18	12
San Joaquin	212	144
Shasta	34,573	23,468
Sierra	4,680	3,177
Siskiyou	7,615	5,169
Stanislaus	1,748	1,187
Tehama	68	46
Trinity	4,679	3,176
Tulare	44	30
Tuolumne	3,034	2,059
Yuba	9,170	6,224
Totals	2,599,139	$1,764,264

[1] Combined to avoid disclosure of individual output.

The following paragraph is quoted from the U. S. Bureau of Mines,[1] chapter on Gold and Silver from Mineral Year Book 1940, by courtesy of Charles White Merrill and H. M. Gaylord.

"*Silver.* The bulk of the silver output of California in 1939 was more localized than that of gold; the 10 leading properties listed below produced 83 percent of the total recoverable silver. Newcomers to the list in 1939 were the Walker mine, Genessee district, Plumas County, and the Alabama mine, Ophir district, Placer County, which displaced the Silverado-Kentuck, Mount Patterson district, Mono County, and the Idaho Maryland mine, Grass Valley-Nevada City district, Nevada County. The two new mines were substantial producers in 1938; the Idaho Maryland dropped only to eleventh place in 1939, but the Silverado-Kentuck, the leading producer for several years prior to 1938, was idle in 1939. Of the 10 leading in 1939, five derived their silver output from gold ore, four from gold-silver ore, and one from copper ore; and only 42,132 ounces of silver were derived from straight silver ores in California in 1939. In addition to the yield of the companies listed, some silver output was reported recovered from almost every lode and placer mine operating in the State in 1939."

[1] U. S. Bureau of Mines, Mineral Year Book, 1940, p. 210.

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Ten Leading Silver Producers in California in 1939, in Order of Output

Rank	Mine	District	County	Rank in 1938	Operator	Source of silver
1	Cactus Queen	Mojava	Kern	1	Cactus Mines Co.	Gold-silver
2	Golden Queen	Mojave	Kern	5	Golden Queen Mining Co.	Gold ore
3	Grigsby (Palisade)	Calistoga	Napa	6	Graham Loftus Oil Corp.	Gold-silver
4	Lava Cap	Grass Valley-Nevada City	Nevada	2	Lava Cap Gold Mining Corp.	Gold ore
5	Starlight	Mojave	Kern	3	Lodestar Mining Co.	Gold ore
6	Walker	Genessee	Plumas	11	Walker Mining Co.	Copper ore
7	Kelly	Randsburg	San Bernardino	4	F. Royer & Lessees	Gold-silver
8	Empire Star Mines	Grass Valley-Nevada City	Nevada	8	Empire Star Mines Co., Ltd.	Gold ore
9	Standard	Bodie	Mono	9	Roseklip Mines Co.	Gold-silver
10	Alabama	Ophir	Placer	13	Alabama California Gold Mines Co.	Gold ore

Silver Production of California, by Years.

The amount and value of the silver production of California, and the average price, annually, since 1880 are given in the table following. In the table shown in the statistical bulletins previous to Bulletin 97 (for 1925), the values shown for 1880-1904 (inc.) were taken from the reports of the Director of the Mint, of which the figures for 1880-1896 (inc.) were based on 'coinage value' ($1.2929 per fine ounce). We have recalculated these to commercial value, using the price table of the U. S. Geological Survey (McCaskey, H. D.), Gold and Silver, 1913: Mineral Resources of the U. S., Part I, p. 847. From 1905 to date, the figures are those of the U. S. Geological Survey and its successor, the U. S. Bureau of Mines. Figures for the years prior to 1880 are not available, as there were no reliable records compiled.

Silver Production of California, by Years, Since 1880

Year	Fine oz.	Value	Average price per oz.	Year	Fine oz.	Value	Average price per oz.
1880	882,169	$1,014,494	$1 15	1911	1,270,445	$673,336	$0 53
1881	580,091	655,503	1 13	1912	1,300,136	799,584	615
1882	653,569	745,069	1 14	1913	1,378,399	832,553	604
1883	1,129,244	1,253,461	1 11	1914	1,471,859	813,938	553
1884	3,236,987	3,593,056	1 11	1915	1,678,756	851,129	507
1885	1,968,260	2,125,298	1 07	1916	2,564,354	1,687,345	658
1886	1,245,747	1,233,290	99	1917	1,775,431	1,462,955	824
1887	1,262,282	1,237,036	98	1918	1,427,711	1,427,711	1 00
1888	1,314,874	1,235,982	94	1919	1,107,189	1,240,051	1 12
1889	823,947	774,510	94	1920	1,706,327	1,859,896	1 09
1890	820,336	861,353	1 05	1921	3,629,223	3,629,223	1 00
1891	737,224	729,852	99	1922	3,100,065	3,100,065	1 00
1892	358,575	311,960	87	1923	3,559,443	2,918,743	82
1893	415,468	324,065	78	1924	3,555,133	2,381,952	67
1894	229,896	144,834	63	1925	3,054,416	2,119,765	694
1895	463,911	301,542	65	1926	2,022,460	1,262,015	624
1896	326,757	222,195	68	1927	1,620,242	918,677	567
1897	754,648	452,789	60	1928	1,478,711	865,081	585
1898	701,788	414,055	59	1929	1,176,895	627,285	533
1899	855,869	513,521	60	1930	1,622,803	624,779	385
1900	1,168,157	724,257	62	1931	867,818	251,667	290
1901	950,831	570,499	60	1932	493,533	139,176	282
1902	1,163,041	616,412	53	1933	402,591	140,907	350
1903	958,230	517,444	54	1934	844,413	545,883	*644
1904	1,441,259	835,929	58	1935	1,191,112	856,112	*719
1905	1,076,174	650,009	61	1936	2,103,799	1,629,392	*775
1906	1,220,641	817,830	68	1937	2,888,265	2,234,073	*774
1907	1,138,856	751,646	66	1938	2,590,804	1,674,863	*646
1908	1,647,278	873,057	53	1939	2,599,139	1,764,264	*678
1909	2,098,253	1,091,092	52				
1910	1,840,085	993,646	54	Totals	88,953,799	$65,918,116	

*Average price applied to newly mined within the United States.

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TIN

Bibliography: Reports XV, XVII, XVIII, XXV, XXXI, XXXIV, XXXV. Bulletins 67, 91.

In 1928 and 1929 there was a small amount of tin produced from California ore as well as considerable development work which was done at the Temescal mine in Riverside County near Corona. There was an output from the district during 1891-1892 as tabulated below. Small quantities of stream tin have been found in some of the placer workings in northern California, but never in paying amounts.

Two occurrences have also been noted, in northern San Diego County. Crystals of cassiterite were found there, associated with blue tourmaline crystals, amblygonite and beryl. No commercial quantity has been developed, only small pockets having been taken out.

Total Output of Tin in California

Year	Pounds	Value
1891	125,289	$27,564
1892	126,000	32,400
1928 1929*	1,200	580
Totals	252,489	$60,544

*Annual details concealed under 'Unapportioned.'

TITANIUM

Bibliography: State Mineralogist's Report XXIII, XXXIV.

During 1939 there was a small shipment of titanium ore (ilmenite) made from material recovered from beach sand at Hermosa Beach, Los Angeles County. The annual details are concealed under the 'Unapportioned' item to conceal the output of an individual producer.

In 1938 the E. I. du Pont de Nemours Company did exploration work on the deposit of ilmenite in the San Gabriel Mountains in Los Angeles County to determine the extent of the deposit. They also ran an experimental test on the ores for commercializing it in the near future.

In 1927 the first recorded shipments of titanium minerals were made in California. The total of the 1927 and 1928 production was 10,013 tons valued at $150,195. All of this came from Los Angeles County and was produced from either the beach black sands which contained approximately 20% titaniferous iron and magnetite, the gangue being silica and several silicates, or from a lode deposit in the San Gabriel Mountains.

The metal is used in several different alloys with iron, copper and aluminum and for green and white paint pigments, the only colors of titanium pigments now in common use. It is also used in dyes, rubber, as a porcelain glaze, in glass, and cement made from high-titanium iron slags. This cement is resistant to the action of acids.

The market price of titanium minerals varies as to the titanium oxide it contains. Present (May 2, 1940) quotations are: Rutile 94%

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TiO at 10¢ a pound, ilmenite 50 to 60% TiO at $16 to $18 a ton, all prices Atlantic seaboard.

TUNGSTEN

Bibliography: Reports XV, XVII, XVIII, XXII, XXIV, XXVII (inc.) XXX, XXXIV, XXXV. Bulletins 38, 67, 91, 95, U. S. G. S., Bull. 652. Proc. Colo. Sci. Soc., Vol. XI. South Dakota School of Mines, Bulletin No. 12. Eng. and Min. Jour.-Press, Vol. 113, pp. 666-669, Apr. 22, 1922.

The commercial production of tungsten ores and concentrates in California began in 1905; and has been continuous since, with the exception of 1920-1922 inclusive. The material shipped in 1939 was high-grade sorted ore and concentrates, came from four properties in Inyo County, two in San Bernardino County, and a single property each in Fresno, Kern, Mono, and Tulare counties. A total of 1,221

Photo by John M. Hague

Pine Creek Tungsten Mine, Pine Creek, Inyo County

short tons of concentrates averaging 60.7 per cent WO_3 was reported shipped, yielding 74,110 units or 1,235 tons of 60 per cent WO_3 and valued at $1,153,735 at the mine. The 1939 output showed an increase in both amount and value as compared with that of 1938, which was 768 tons of 60% WO_3 contents worth $786,860, and was the largest annual yield since 1918.

Quotations in the "E. & M. J. Metal and Mineral Markets" during 1939 for Chinese wolframite, duty paid, in January was $19.50 per unit WO_3, declining to $18 per unit WO_3 in June and raising to $23 a unit WO_3 in September and ending the year at $23.50 a unit WO_3. Domestic scheelite in January was $16 to $19 per unit WO_3, dropped to $15 to $16 a unit WO_3 in May, increased to $23 to $25 a unit WO_3 in September and ended the year at $22 to $24 a unit WO_3. The pres-

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ent (July 25, 1940) quotations per unit WO_3 are Chinese wolframite duty paid $23.50; domestic scheelite $22 to $23.

Imports of foreign tungsten ores and concentrates during 1939 according to the U. S. Bureau of Foreign and Domestic Commerce amounted to 2,743,472 pounds valued at $997,971, compared with 322,085 pounds worth $138,693 in 1938. The Tariff Act of 1930 raised the duty on tungsten ore or concentrates to 50 cents per pound on the metallic tungsten contained therein. Duties are also provided for imported tungsten-bearing alloys.

Tungsten ore has been produced in California principally in the Atolia-Randsburg district in San Bernardino and Kern counties, followed by the Bishop district in Inyo County, with small amounts coming from Nevada County and from the district near Goffs, in eastern San Bernardino. Most of California's tungsten ore is scheelite (calcium tungstate), though wolframite (iron-manganese tungstate) and hübernite (manganese tungstate) also occur. The deposits at Atolia were the largest and most productive scheelite deposits known, previous to 1930.[1] (Since passed by Mill City District, Nevada).

Total Tungsten Ore Production of California.

The annual amount and value of tungsten ores and concentrates produced in California since the inception of the industry is given herewith, with tonnages recalculated to 60% WO_3:

Year	Tons at 60% WO_3	Value	Year	Tons at 60% WO_3	Value
1905	57	$18,800	1924	781	$446,009
1906	485	189,100	1925	573	348,475
1907	287	120,587	1926	441	316,560
1908	105	37,750	1927[a]	389	429,237
1909	577	190,500	1928		
1910	457	208,245	1929	150	106,280
1911	387	127,706	1930[a]	120	82,582
1912	572	206,000	1931		
1913	559	234,673	1932	26	9,509
1914	420	180,575	1933	148	76,605
1915	962	1,005,467	1934	261	224,417
1916	2,270	4,571,521	1935	118	194,542
1917	2,466	3,079,013	1936	236	210,819
1918	1,982	2,832,222	1937	611	782,187
1919	214	219,316	1938	732	786,860
1920			1939	1,235	1,152,735
1923	34	19,126	Totals	17,664	$18,407,314

[a] Annual details concealed under 'Unapportioned.'

VANADIUM

Bibliography: Reports XV, XXVI. Bulletins 67, 91. Proc. Colo. Sci. Soc., Vol. XI. U. S. Bur. of Mines, Bulletin 104.

No commercial production of vanadium has yet been made in California. Occurrences of this metal have been found at Camp Signal, near Goffs, in San Bernardino County, and two companies at one time did considerable development work in the endeavor to open up paying quantities. Some ore carrying lead vanadate has been developed in the 29 Palms, or Washington district, on the line between Riverside and San Bernardino counties, but no shipments reported.

[1] U. S. G. S. Bull. 652, p. 32.

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The principal use of vanadium is as an alloy in steels, especially in tool steel, and in those varieties where resistance to repeated strains is required. Present (May 2, 1940) New York quotations for ferro-vanadium are \$2.70-\$2.90 per pound of vanadium f.o.b. works, and vanadium ore 27¢ per pound V_2O_5 contained.

ZINC

Bibliography: State Mineralogist Reports XIV, XV, XVII, XVIII, XX-XXIV, XXVI, XXVII, XXX, XXXIII-XXXV) (inc.), Bulletins 38, 67, 91.

The recoverable zinc mined in California during 1939 amounted to 16,390 pounds valued at \$852, compared with 17,554 pounds worth \$843 in 1938. The 1939 output came from properties in Inyo, Orange, and San Bernardino counties.

The zinc ores of Shasta and Calaveras counties are associated with copper, while those of Inyo, Los Angeles, and San Bernardino are associated principally with lead-silver and zinc-silver ores.

The production of metallic zinc [1] at reduction plants in the United States during 1939 amounted to 557,664 short tons valued at \$57,997,000, of which 16,178 tons were reduced from foreign ores and 50,428 tons from secondary metal. The 1939 output was an increase in both amount and value as compared with that of 1938, which was 477,954 tons worth \$45,884,000.

The average price per pound for zinc in 1939 was 5.2¢ compared with 4.8¢ in 1938; 6.5¢ in 1937; 5¢ in 1936; 4¢ in 1935; and 4.3¢ in 1934.

Total Zinc Production of California.

Total figures for zinc output of the State are as follows, commercial production dating back only to 1906:

Year	Pounds	Value	Year	Pounds	Value
1906	206,000	\$12,566	1923		
1907	177,759	10,598	1924	3,060,000	\$198,900
1908	54,000	3,544	1925	11,546,602	877,542
1909			1926	20,447,559	1,533,568
1910			1927	8,625,004	552,000
1911	2,679,842	152,751	1928		
1912	4,331,391	298,866	1929		
1913	1,157,947	64,845	1931	149,865	5,314
1914	399,641	20,381	1932		
1915	13,043,411	1,617,383	1933	290,222	12,189
1916	15,950,565	2,137,375	1934	721,719	31,034
1917	11,854,804	1,209,190	1935	328,013	14,432
1918	5,565,516	506,466	1936	29,740	1,487
1919	1,284,192	101,046	1937	39,643	2,577
1920	1,188,009	96,229	1938	17,554	843
1921	846,184	42,309	1939	16,390	852
1922	3,034,430	172,963			
			Totals	107,146,050	\$9,677,250

[1] U. S. Bureau of Mines, Mineral Market Report 817, April 8, 1940.

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CHAPTER FOUR

STRUCTURAL MATERIALS

Bibliography: State Mineralogist Reports XII-XXXV (inc.). Bulletin 38. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

As indicated by this subdivision heading, the mineral substances herein considered are those more or less directly used in building and structural work. California is independent, so far as these are concerned, and almost any reasonable construction can be made with materials produced in the State. Chromite, which previous to 1933 was listed under structural materials in the statistical reports of the State Division of Mines, is now transferred to the metals group, thus coinciding with the practice of the United States Bureau of Mines.

This branch of the mineral industry for 1939 was valued at $30,373,840 as compared with a total of $30,880,924 for the year 1938. Materials grouped under this classification showing increased values in 1939 were brick and building tile, lime, cement, granite, magnesite, marble, sandstone and slate.

In 1938 all counties contributed to this structural total. There is not a county in the fifty-eight counties of the State which is not capable of producing at least one of the materials under the classification.

The following summary shows the value of the structural materials produced in California during the years 1938-1939, with increases or decreases in each instance:

Substance	1938		1939		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Bituminous rock			16,546 tons	$63,612	
Brick and hollow building tile		$2,594,546		3,063,660	$469,114+
Cement	10,561,037 bbls.	15,502,574	10,984,033 bbls.	15,616,219	113,645+
Granite		131,386		145,194	13,808+
Lime	70,078 tons	683,403	87,288 tons	849,122	165,719+
Marble[a]		6,015		14,822	8,807+
Sandstone		9,384		12,494	3,110+
Slate	6,871 tons	30,281	5,777 tons	28,327	1,954+
Stone, miscellaneous		11,734,038	18,681,305 tons	10,316,787	1,417,251—
Unapportioned		[b]189,297		[c]263,603	74,306+
Total values		$30,880,924		$30,373,840	
Net decrease					$507,084

[a] Includes onyx and travertine.
[b] Includes bituminous rock, magnesite, paving blocks, serpentine, tube-mill pebbles.
[c] Includes magnesite, paving blocks, tube-mill pebbles.

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ASPHALT

Bibliography: State Mineralogist Reports VII, X, XII-XV (inc.), XVII, XVIII. Bulletins 16, 32, 63, 67, 69, 91.

Asphalt was for a number of years accounted for in the statistical reports by the State Mining Bureau, because in the early days of the oil industry, considerable asphalt was produced from outcroppings of oil sand, and was a separate industry from the production of oil itself. However, at the present time most of the asphalt comes from the oil refineries, which produce a better and more uniform grade; hence, its value is not now included in the mineral total, as to do so would be in part a duplication of the crude petroleum figures. Such natural asphalt as is at present mined is in the form of bituminous sandstones, and is recorded under that designation.

BITUMINOUS ROCK

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XXI, XXII, XXV, XXVI, XXXI.

This material is essentially an uncemented sandstone which is saturated with and held together by a natural asphaltic constituent, probably the residue from the evaporation of a crude petroleum deposit. Bituminous rock is still used to a limited extent for road dressing in those districts adjacent to available deposits, though the manufacture of asphalt at the oil refineries has almost entirely superseded the direct use of the native material. Some of the Santa Cruz County production is put on the market as a material which can be laid cold. This material is especially applicable and valuable for patch jobs.

During 1939 the output of bituminous rock amounted to 16,546 short tons valued at $63,612, coming from two properties in Santa Barbara County and one in Santa Cruz County. The 1939 production was a decrease in amount and value as compared with that of 1938. The figures for 1938 were concealed under the 'Unapportioned' item so as not to reveal the annual output of a single operator in each Santa Barbara and Santa Cruz county. The total of the 1937 and 1938 yield was 36,128 tons worth $139,242.

Bituminous Rock Production of California, by Years.

The following tabulation shows the total amount and value of bituminous rock quarried and sold in California, from the records compiled by the State Mining Bureau, annually since 1887:

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Year	Tons	Value	Year	Tons	Value
1887	36,000	$160,000	1914	66,119	$166,618
1888	50,000	257,000	1915	17,789	61,468
1889	40,000	170,000	1916	19,449	66,561
1890	40,000	170,000	1917	5,590	18,580
1891	39,962	154,164	1918	2,561	9,067
1892	24,000	72,000	1919	4,614	18,537
1893	32,000	192,036	1920	5,450	27,825
1894	31,214	115,193	1921	8,298	43,192
1895	38,921	121,586	1922	4,624	13,570
1896	49,456	122,500	1923	2,945	11,780
1897	45,470	128,173	1924	6,040	14,922
1898	46,836	137,575	1925	2,681	10,724
1899	40,321	116,097	1926	3,863	21,577
1900	25,306	71,495	1927	3,515	17,704
1901	24,052	66,354	1928	4,966	33,832
1902	33,490	43,411	1929	3,320	14,360
1903	21,944	53,106	1930	8,525	36,075
1904	45,280	175,680	1931		
1905	24,753	60,436	1932 *	23,653	109,140
1906	16,077	45,204	1933		
1907	24,122	72,835	1934 *	36,793	130,301
1908	30,718	109,818	1935		
1909	34,123	116,436	1936 *	41,681	133,344
1910	87,547	165,711	1937		
1911	75,125	117,279	1938 *	36,128	139,242
1912	44,073	87,467	1939	16,546	63,612
1913	37,541	78,479	Totals	1,363,481	$4,342,066

* Annual details concealed under 'Unapportioned.'

BRICK AND HOLLOW TILE

Bibliography: State Mineralogist Reports VIII, X, XII-XV (inc.), XVII-XXVIII (inc.), XXXII. Bulletins 38, 99. Preliminary Report No. 7. Cal. Jour. of Development, June, 1925, pp. 5-6.

Bricks of many varieties and in important quantities are annually produced in California, as might be expected in a state with such diversified and widespread mineral resources. The varieties include common, fire, pressed, glazed, enamel, fancy, vitrified, sand-lime, and others. Not only do the plants here supply practically all of our own requirements in these products, but considerable quantities are shipped to contiguous territory and certain products are shipped over a much wider radius. We also include under this heading the various forms of hollow building 'tile' or blocks.

The 1939 output of all kinds of brick in California showed an increase in value of 18 per cent and in amount of 16 per cent as compared with that of 1938. The 1939 production consisted of 126,999 M. of common brick valued at $1,419,914; 17,263 M. of fire brick valued at $1,186,147; 6,241 M. of glazed, pressed, fancy, and vitrified paving brick valued at $200,319; and 16,283 tons of hollow building tile valued at $257,280; which gave a total value for the year for brick and hollow building tile of $3,063,660. The 1938 output had a total value of $2,594,546.

Los Angeles County had the largest production of brick and hollow building tile in 1939 with 16 companies producing 66,390 M. of common brick valued at $757,668; 7,769 M. of fire brick valued at $556,630; 2,131 M. of glazed, pressed, and fancy brick valued at $62,941; and 1,862 tons of hollow building tile valued at $20,393. Contra Costa County with three plants operating had an output of brick and hollow building tile worth $695,508. There were two operating plants each

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in Alameda, Kern, Sacramento, San Diego, San Joaquin, Santa Barbara, and Santa Clara counties and one each in Amador, Fresno, Humboldt, Orange, Placer, Riverside, San Bernardino, San Luis Obispo, and Tulare counties. Included in the output of Alameda County was some face hollow building-tile.

Brick and Hollow-Tile Production of California, by Years.

Record of brick production in the state has been kept since 1893 by this Bureau, the figures for hollow building 'tile' or blocks being also included since 1914. The annual and total figures, for amount and value, are given in the following table:

Year	Brick, M	Hollow building blocks, tons	Value
1893	103,900		$801,750
1894	81,675		457,125
1895	131,772		672,360
1896	24,000		524,740
1897	97,468		563,240
1898	100,102		571,362
1899	125,950		754,730
1900	137,191		905,210
1901	130,766		860,488
1902	169,851		1,306,215
1903	214,403		1,999,546
1904	281,750		1,994,740
1905	286,618		2,273,786
1906	277,762		2,538,848
1907	362,167		3,438,951
1908	332,872		2,506,495
1909	333,846		3,059,929
1910	340,883		2,934,731
1911	327,474		2,638,121
1912	337,233		2,940,290
1913	358,754		2,915,350
1914	270,791		2,288,227
1915	180,538		1,678,756
1916	206,960		2,096,570
1917	192,269	29,348	2,532,721
1918	136,374	34,818	2,363,481
1919	156,328	36,026	3,087,067
1920	245,842	99,208	5,704,393
1921	238,022	67,100	5,570,875
1922	374,853	105,909	7,994,991
1923	397,754	122,534	9,738,082
1924	456,716	114,469	9,137,908
1925	361,094	105,491	7,503,976
1926	388,048	90,332	7,026,124
1927	374,111	75,116	6,516,077
1928	272,443	66,277	5,694,770
1929	327,011	66,713	5,607,410
1930	267,019	68,047	4,205,460
1931	151,545	51,988	2,560,415
1932	90,683	27,098	1,605,086
1933	76,905	25,814	1,520,481
1934	66,738	17,534	1,644,661
1935	76,521	21,309	1,855,343
1936	131,667	16,081	2,240,905
1937	148,833	17,521	3,083,902
1938	129,273	16,592	2,594,546
1939	150,503	16,283	3,063,660
Totals	10,725,278	1,291,608	$145,673,894

CEMENT

Bibliography: State Mineralogist Reports VIII, IX, XII, XIV, XV, XVII, XVIII, XXI-XXVIII (inc.), XXXII. Bulletin 38.

During 1939 there was a production of 10,984,033 barrels of cement in California valued at $15,616,219 f.o.b. plant; of which 4,645,901 barrels came from northern California plants and 6,338,132

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barrels from southern California plants. The 1939 output showed a slight increase in both amount and value as compared with that of 1938 which was 10,561,037 barrels worth $15,502,574.

Shipments during 1939 were made from ten plants in nine counties to the extent of 11,219,575 barrels valued at $16,015,655, as compared with 10,594,706 barrels worth $15,567,295.

There were five plants in operation in northern California—one each in Calaveras, Contra Costa, Merced, San Mateo, Santa Cruz counties, which shipped 785,901 barrels of cement; and five plants in southern California, two in San Bernardino County and one each in Kern, Los Angeles[1] and Riverside counties, which shipped 7,747,301 barrels of cement. There were 1825 men employed in the above plants during the year 1939.

Cement Production of California, by Years.

'Portland' cement was first commercially produced in California in 1891; though in 1860 and for several years following, a natural hydraulic cement from Benicia was utilized in building operations in San Francisco.

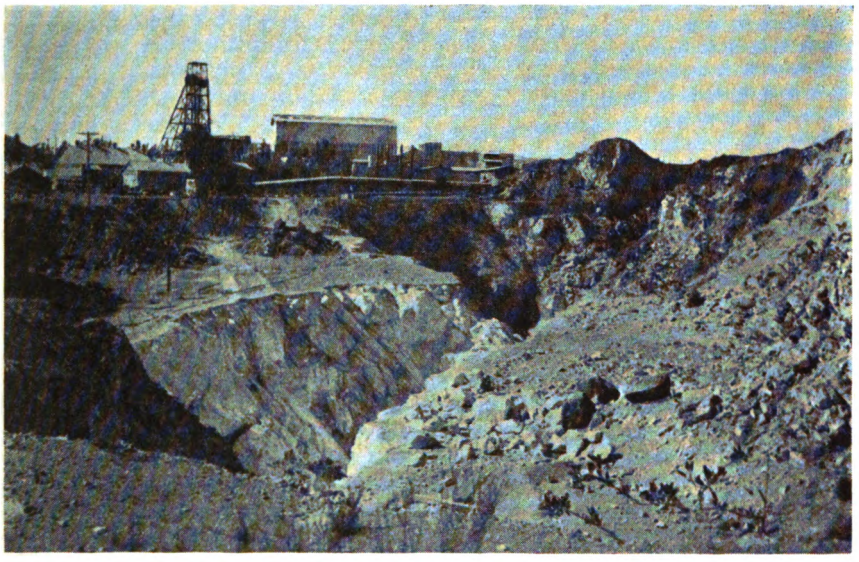

Photo by Walter W. Bradley

Riverside Portland Cement Co. plant at Crestmore, Riverside County

"The Benicia Cement Company in 1859-60 was turning out 50 to 100 barrels of cement a day and San Francisco was using about 12,000 barrels a year. The mill price of the product was then $4 a barrel. By 1865, the San Francisco rate of consumption had increased to 100,000 barrels yearly, brick buildings largely taking the place of frame struc-

[1] The plant in Los Angeles County grinds clinker coming from other counties, therefore the crude material is credited to the point of origin.

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tures, and the price of cement had fallen to $2.50 a barrel, about the same as it is today."[1]

The growth of the industry became rapid after 1902; since which time cement has continued to be an important factor in the industrial life of the State. Although the total cement figures, to date, are not of the same magnitude as those for gold and petroleum, it is interesting to note that the value of California's cement yield in the period 1920-1931 annually exceeded the value of her gold output.

Cement Production of California, by Years

Year	Barrels	Value	Year	Barrels	Value
1891	5,000	$15,000	1916	5,299,507	$6,210,293
1892	5,000	15,000	1917	5,790,734	7,544,282
1893			1918	4,772,921	7,969,909
1894	8,000	21,600	1919	4,645,289	8,591,990
1895	16,383	32,556	1920	6,709,160	14,962,945
1896	9,500	28,250	1921	7,404,221	18,072,120
1897	18,000	66,000	1922	8,962,135	16,524,056
1898	50,000	150,000	1923	10,825,405	25,999,203
1899	60,000	180,000	1924	11,655,131	23,225,850
1900	52,000	121,000	1925	13,206,630	25,043,335
1901	71,800	159,842	1926	13,797,173	25,269,678
1902	171,000	423,600	1927	14,661,783	26,474,935
1903	640,868	968,727	1928	13,625,231	24,463,287
1904	969,538	1,539,807	1929	12,794,729	21,038,565
1905	1,265,553	1,791,916	1930	9,831,938	14,575,731
1906	1,286,000	1,941,250	1931	7,693,712	11,510,655
1907	1,613,563	2,585,577	1932	5,657,549	7,967,107
1908	1,629,615	2,359,692	1933	7,284,031	10,331,395
1909	3,779,205	4,969,437	1934	8,936,065	12,445,616
1910	5,453,193	7,485,715	1935	8,086,292	10,120,721
1911	6,371,369	9,085,625	1936	13,300,188	18,314,589
1912	6,198,634	6,074,661	1937	12,072,062	16,546,229
1913	6,167,806	7,743,024	1938	10,561,037	15,502,574
1914	5,109,218	6,558,148	1939	10,984,033	15,616,219
1915	4,918,275	6,044,950			
			Totals	274,426,496	$444,682,651

GRANITE

Bibliography: State Mineralogist Reports X, XII-XXVI (inc.), XXVIII, XXXI, XXXV. Bulletin 38.

The 1939 output of granite in California amounted to 34,106 cu. ft. of building stone valued at $94,178; 13,787 cu. ft. of monumental stone valued at $37,323; 1,500 linear ft. of curbing valued at $3,000; 124,778 cu. ft. of unclassified material including tuff, volcanic rock, and a small amount of mica schist which were used for building stone and flagstone, having a value of $10,693; and giving a total value for the year's yield at $145,194. This was an increase over the 1938 value, which was $131,386. The 1939 output came from 15 quarries in 13 counties, of which there were two each in San Diego and Sonoma counties and one each in Fresno, Los Angeles, Madera, Mariposa, Nevada, Placer, Riverside, Sacramento, Shasta, Ventura, and Tuolumne counties.

The material from Los Angeles was a mica schist; that from Sonoma County a tuff and that from Shasta and Ventura counties a volcanic rock.

So far as possible, granite production has been segregated in the statement herewith into the various uses to which the product was put.

[1] Monthly Review of Mercantile Trust Co. of Calif., Vol. XIII, No. 3, p. 55, Mar. 1924.

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It will be noted, however, that a portion of the output has been entered under the heading 'Unclassified.' This is necessary because of the fact that some of the producers have no way of telling to what specific use their stone was put after they had quarried and sold the same in the rough.

Varieties.

For building purposes, the granite found in California, particularly the varieties from Raymond in Madera County, Rocklin in Placer County and near Porterville in Tulare County, are unexcelled by any similar stone found elsewhere. The quantities available, notable at Raymond and Porterville, are unlimited. Most of California's 'granite,' particularly that found in the Sierra Nevada Mountains, is technically 'granodiorite' (that is, both plagioclase and orthoclase feldspars are present).

Granites of excellent quality for building and ornamental purposes are also quarried in Riverside, San Bernardino, and San Diego counties. Near Lakeside, San Diego County, there is a fine-grained, 'silver gray' granite of uniform texture and color, especially suited for monumental and ornamental work.

The Fresno County stone is a dark, hornblende diorite, locally called 'black granite,' whose color permits of a fine contrast of polished and unpolished surfaces, making it particularly suitable for monumental and decorative purposes. There is also similar 'black granite' in Tulare County, near Success.

Granite Production of California, by Years.

The value of granite produced, annually, since 1887 has been as follows:

Year	Value	Year	Value
1887	$150,000	1914	$628,786
1888	57,000	1915	227,928
1889	1,329,018	1916	535,339
1890	1,200,000	1917	221,997
1891	1,300,000	1918	139,861
1892	1,000,000	1919	220,743
1893	531,322	1920	495,732
1894	228,816	1921	725,901
1895	224,329	1922	676,643
1896	201,004	1923	760,081
1897	188,024	1924	1,211,046
1898	147,732	1925	1,853,859
1899	141,070	1926	655,332
1900	295,772	1927	1,398,443
1901	519,285	1928	763,996
1902	255,239	1929	1,169,271
1903	678,670	1930	855,477
1904	467,472	1931	636,741
1905	353,837	1932	398,676
1906	344,083	1933	183,706
1907	373,376	1934	249,083
1908	512,923	1935	339,917
1909	376,834	1936	244,243
1910	417,898	1937	207,738
1911	355,742	1938	131,386
1912	362,975	1939	145,194
1913	981,277		
		Total value	$28,070,817

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LIME

Bibliography: State Mineralogist's Reports XIV, XV, XVII-XXIX (inc.), XXXIII-XXXV (inc.), Bulletin 38.

In California during 1939 there was an output of lime amounting to 87,288 short tons valued at $849,122 coming from two plants each in El Dorado and San Bernardino counties; and one each in Alameda, Inyo, Santa Cruz, and Tuolumne counties. The above figures showed an increase in both amount and value over those of 1938 which were 70,578 tons worth $682,403. The 1939 figures on lime were the largest of any annual output on record for California.

So far as we have been able to segregate the data, these figures include mainly only such lime as is used in building operations; though they do include a small proportion of calcined lime employed in agriculture and the chemical industries, the figures for which were not separable. A portion is hydrated lime. Limestone utilized in sugar making, for smelter flux, as a fertilizer, and other special industrial uses, is classified under 'Industrial Materials.' That consumed in cement manufacture is included in the value of cement.

Lime Production of California, by Years.

The following tabulation gives the amounts and value of lime produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. The figures for quantity have been recalculated from 'barrels,' as shown in the earlier reports, to 'tons' for the years 1894-1922 (inc.):

Year	Tons	Value	Year	Tons	Value
1894	37,350	$318,700	1918	43,684	$461,315
1895	39,776	386,094	1919	42,070	552,048
1896	30,275	261,505	1920	46,314	557,232
1897	28,780	252,900	1921	46,353	610,619
1898	29,786	254,010	1922	57,875	671,747
1899	29,985	314,575	1923	70,894	788,834
1900	31,252	283,699	1924	62,029	703,355
1901	31,738	334,688	1925	61,922	685,528
1902	44,866	369,616	1926	63,568	670,837
1903	49,659	418,280	1927	60,498	631,497
1904	57,945	571,749	1928	56,616	547,919
1905	61,700	555,322	1929	42,834	417,101
1906	68,927	763,060	1930	47,662	452,084
1907	68,422	756,376	1931	36,189	360,523
1908	39,639	379,243	1932	27,510	254,223
1909	52,075	577,824	1933	33,425	271,619
1910	47,951	477,683	1934	32,500	309,765
1911	42,959	390,988	1935	59,731	573,212
1912	52,212	464,440	1936	64,275	633,678
1913	61,344	528,547	1937	69,532	681,277
1914	43,996	378,663	1938	70,578	683,403
1915	35,653	286,304	1939	87,288	849,122
1916	49,364	390,475			
1917	50,073	311,380	Totals	2,269,174	$22,393,054

MAGNESITE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVII-XXVII (inc.), XXX, XXXI, XXXIV. Bulletins 38, 79, 91. U. S. Geol. Surv., Bulletins 355, 540. Min. Res. 1913, Pt. II, pp. 450-453. Min. & Sci. Press, Vol. 114, p. 237. "Magnesite"—Hearings before Comm. on Ways and Means, House of Repr., on H. R. 5218, June 16, 17, and July 17, 1919. Eng. Soc. W.

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Penn., Proc. 1913, Vol. 29, pp. 305-388, 418-444. Eng. & Min. Jour.-Pres., Vol. 114, July 29, and Dec. 2, 1922. U. S. Tariff Comm., "Crude and Caustic Calcined Magnesite. A Preliminary Statement of Information," May 19, 1926.

The production of crude magnesite in California during 1939 came from a single property each in Santa Clara and Stanislaus counties, both being operated by the same company. The annual details are concealed under the 'Unapportioned' item so as not to reveal the output of this single operator. Practically all was shipped in the calcined form.

The output for 1939 showed an increase in both amount and value over that of 1938. The 1938-1939 production showed a total of 47,954 short tons of crude magnesite valued at $375,005, of which only a small amount was sold as such. Most of this material was calcined. The operators reports showed that a total of 36,758 short tons of calcined material valued at $987,370, rail-shipping point, was made during 1938-1939 and was both deadburned for refractories and material for the plastic trade.

In California the known deposits are mostly in the metamorphic rocks of the Coast Ranges and the Sierra Nevada, being associated with serpentine areas. The notable exceptions are the sedimentary deposits at Bissell in Kern County and at Afton in San Bernardino County. Several thousand tons have been shipped from the Bissell deposit; and small shipments have been made from the Afton property. Beginning in 1938, a portion of the market for calcined magnesite is being supplied by magnesium oxide produced from salt-works bitterns at a plant at Newark, Alameda County, on San Francisco Bay. The figures for the crude of above tonnage are included under those for magnesium salts in the Salines chapter.

Imports.

The tariff act of 1930 placed the following import duties on magnesite: Crude magnesite 15/32¢ per lb., caustic calcined magnesite 15/16¢ per lb., dead-burned and grain magnesite, not suitable for manufacture into oxychloride cements, 23/40¢ per lb.; magnesite brick ¾¢ per lb., and 10 per cent ad valorem. The figures of imports for 1939, as published by the U. S. Bureau of Foreign and Domestic Commerce, show a total of 47,206 short tons valued at $858,004 as compared with 26,479 short tons worth $376,397 in 1938.

Total Magnesite Production of California.

The first commercial production of magnesite in California was made in the latter part of 1886 from the Cedar Mountain district,[1] southeast of Livermore, Alameda County. Shipments amounting to 'several tons' or 'several carloads' were sent by rail to New York; but there is apparently no exact record of the amount for that first year. The statistical records of the State Mining Bureau began with the year 1887, and the table herewith shows the figures for amount and value, annually, from that time. Shipments of magnesite from

[1] See U. S. Geol. Surv.; Mineral Resources of U. S., 1886, pp. 6 and 696.

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Napa County began in 1891 from the Snowflake Mine; from the Red Mountain deposits in Santa Clara County, in 1899; and from Tulare County in 1900.

Total Magnesite Production of California

Year	Tons	Value	Year	Tons	Value
1887	600	$9,000	1914	11,438	$114,380
1888	600	9,000	1915	30,271	283,461
1889	600	9,000	1916	154,052	1,311,893
1890	600	9,000	1917	209,648	1,976,227
1891	1,500	15,000	1918	83,974	803,492
1892	1,500	15,000	1919	44,696	452,094
1893	1,093	10,930	1920	83,695	1,033,491
1894	1,440	10,240	1921	47,837	511,102
1895	2,200	17,000	1922	55,637	594,665
1896	1,500	11,000	1923	73,963	946,643
1897	1,143	13,671	1924	67,236	900,183
1898	1,263	19,075	1925	64,623	872,944
1899	1,280	18,480	1926	50,915	587,642
1900	2,252	19,333	1927	46,093	577 887
1901	4,726	43,057	1928	45,645	501,590
1902	2,830	20,655	1929	47,269	488,014
1903	1,361	20,515	1930	38,681	388,472
1904	2,850	9,298	1931	21,576	182,283
1905	3,933	16,221	1932*	40,303	282,325
1906	4,032	40,320	1933*		
1907	6,405	57,720	1934*	62,509	413,228
1908	10,582	80,822	1935*		
1909	7,942	62,588	1936*	94,491	734,443
1910	16,570	113,887	1937*		
1911	8,858	67,430	1938*	47,954	375,005
1912	10,512	105,120	1939*		
1913	9,632	77,056	Totals	1,530,760	$15,231,882

* Combined under 'Unapportioned.'

MARBLE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVII-XXX (inc.), XXXIV, XXXV. Bulletin 38. U. S. Bur. of Mines Bull. 106.

The 1939 production of marble in California was valued at $14,822 (including some onyx and travertine from Solano County, and a small amount of limestone used as building stone and flagstone coming from a single operator each in San Luis Obispo and Santa Barbara counties). The marble came from a single quarry each in San Bernardino and Tuolumne counties. The 1939 output showed an increase in value over that of 1938 which was $6,015.

California has many beautiful and serviceable varieties of marble, suitable for almost any conceivable purpose of construction or decoration. In the decorative class are deposits of onyx marble of beautiful coloring and effects. There is also serpentine marble suitable for electrical switchboard use.

Marble Production of California, by Years.

Data on annual production since 1887, as compiled by the State Mining Bureau, follows. Previous to 1894 no records of amounts were preserved.

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Total Production of Marble in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$5,000	1914	25,436	$48,832
1888		5,000	1915	22,186	41,518
1889		87,030	1916	25,954	50,280
1890		80,000	1917	24,755	62,950
1891		100,000	1918	[a]17,428	49,898
1892		115,000	1919	25,020	74,482
1893		40,000	1920	[b]29,531	92,899
1894	38,441	98,326	1921	30,232	98,395
1895	14,864	56,566	1922	38,321	127,792
1896	7,889	32,415	1923	28,015	124,919
1897	4,102	7,280	1924	[b]61,579	140,253
1898	8,050	23,594	1925	35,664	116,105
1899	9,682	10,550	1926	34,806	119,999
1900	4,103	5,891	1927	[b]42,308	103,689
1901	2,945	4,630	1928	[b]34,324	82,190
1902	19,305	37,616	1929	[b]72,881	93,661
1903	84,624	97,354	1930	[b]65,775	82,194
1904	55,401	94,208	1931	[b]37,776	81,760
1905	73,303	129,450	1932	[b]25,506	42,505
1906	31,400	75,800	1933	[b]9,039	23,178
1907	37,512	118,066	1934	[b]7,185	10,759
1908	18,653	47,665	1935	(b)	9,884
1909	79,600	238,400	1936	(b)	23,011
1910	18,960	50,200	1937	(b)	23,667
1911	20,201	54,103	1938	(b)	6,015
1912	27,820	74,120	1939	(b)	14,822
1913	41,654	113,282			
			Total value		$3,538,203

[a] Includes onyx and serpentine.
[b] Includes onyx and travertine.

ONYX and TRAVERTINE

Bibliography: State Mineralogist Reports XII-XV (inc.), XVII, XVIII, XXI, XXIII, XXXI, XXXIV. Bulletin 38.

Onyx and travertine are known to exist in anumber of places in California, but there has been only a small and irregular production since the year 1896. In 1939 there was one producer of onyx in Solano County. The 1938 output showed a decrease in both quantity and value from that 1937, the figures of which are combined with marble. This material is used in terrazzo, auto gear-shift handles, bases for fountain-pen sets, and other ornamental purposes.

Onyx Production of California, by Years.

Production by years has been as follows:

Year	Value	Year	Value
1887	*	1924	*
1888	$900	1925	$16,120
1889	900	1926	7,575
1890	900	1927	*
1891	1,500	1928	*
1892	2,400	1929	*
1893	1,800	1930	*
1894	27,000	1931	*
1895	20,000	1932	*
1896	12,000	1933	*
1918	24,000	1934	*
1919	*	1935	*
1920		1936	*
1921	1,294	1937	*
1922	3,320	1938	*
1923	2,510	1939	*
		Total value	$122,219

* See under Marble.

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SANDSTONE

Bibliography: State Mineralogist Reports XII-XV, XVII, XVIII, XXI, XXIII, XXVI-XXVIII (inc.), XXXIV, XXXV. Bulletin 38. U. S. Bur. of Mines, Bull. 124.

An unlimited amount of high-grade sandstone is available in California, but the wide use of concrete in buildings of every character, as well as the popularity of a lighter-colored building stone, has curtailed production in this branch of the mineral industry during recent years almost to the vanishing point. In 1939 a total of 54,380 cu. ft. of sandstone valued at $12,494 was quarried in California and came from three properties in Monterey County and one each in Colusa, Los Angeles, and Napa counties.

Practically all of the material was flagstone which is used in garden walks, fountains, walls and fireplaces to give effect to Spanish and English types of homes. The material reported from Monterey county is in reality an indurated shale of the Monterey series, of a cream color and utilized as a building stone. Part of the material coming from Los Angeles County was schist and indurated shale.

Sandstone Production of California, by Years.

Amount and value, so far as contained in the records of this Bureau, are presented herewith, with total value from 1887 to date:

Year	Cubic feet	Value	Year	Cubic feet	Value
1887		$175,000	1914	111,691	$45,322
1888		150,000	1915	63,350	8,438
1889		175,598	1916	17,270	10,271
1890		100,000	1917	31,090	7,074
1891		100,000	1918	900	400
1892		50,000	1919	5,400	3,720
1893		26,314	1920	10,500	2,300
1894		113,592	1921	10,150	2,112
1895		35,373	1922	900	1,100
1896		28,379	1923	7,000	13,000
1897		24,086	1924	6,700	3,600
1898		46,384	1925	14,704	14,362
1899	56,264	103,384	1926	34,100	17,500
1900	378,468	254,140	1927	222,900	205,400
1901	266,741	192,132	1928	134,100	43,250
1902	212,123	142,506	1929	177,655	49,881
1903	253,002	585,309	1930	160,704	56,404
1904	363,487	567,181	1931	110,244	30,960
1905	302,813	483,268	1932	41,793	13,286
1906	182,076	164,068	1933	25,980	10,888
1907	159,573	148,148	1934	21,738	14,245
1908	93,301	55,151	1935	38,426	9,268
1909	79,240	37,032	1936	24,705	9,180
1910	165,971	80,443	1937	73,190	15,680
1911	255,313	127,314	1938	43,107	9,384
1912	66,487	22,574	1939	54,380	12,494
1913	62,227	27,870	Total value		$4,624,665

SERPENTINE

Bibliography: State Mineralogist Report XV. Bulletin 38.

Serpentine has not been produced in California to a very large extent at any time. A single deposit, that on Santa Catalina Island, has yielded the principal output to date. Some material was shipped from there in 1917 and 1918, being the only output recorded since 1907. It was used for decorative building purposes and for electrical switch-

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boards. As there was but a single operator, the figures were combined with those of marble output for those years.

The production of serpentine prior to 1919 was 'verde antique' which is used as an ornamental stone and often classed as a marble. In recent years experimental tests have proved several possible commercial applications to which this mineral might be put such as an admix in cement, in the manufacture of magnesium chemicals, in terrazzo, as a substitute for soapstone, and as a filler. During 1938 there was a small shipment of serpentine from one property in San Bernardino County. The annual details are concealed in the 'Unapportioned' item so as not to reveal the output of an individual.

Serpentine Production of California, by Years.

The following table shows the amount and value of serpentine from 1895 as recorded by this bureau:

Serpentine Production in California, by Years

Year	Cubic feet	Value	Year	Cubic feet	Value
1895	4,000	$4,000	1905		
1896	1,500	6,000	1906	847	$1,694
1897	2,500	2,500	1907	1,000	3,000
1898	750	3,000	1917	[a]	[a]
1899	500	2,000	1918	[b]	[b]
1900	350	2,000	1919		
1901	89	890	1938	[a]	[a]
1902	512	5,065			
1903	99	800			
1904	200	2,310	Totals	12,347	$33,259

[a] Under 'Unapportioned.'
[b] See under Marble.

SLATE

Bibliography: State Mineralogist Reports XV, XVIII, XXIV, XXVIII, XXXIV. Bulletin 38. U. S. Geol. Surv., Bull. 586. U. S. Bur. of Mines, Bull. 218.

Slate was first produced in California in 1889. Up to and including 1910 such production was continuous, but since then it has been irregular. Large deposits of excellent quality are known in the State, especially in El Dorado, Calaveras and Mariposa counties, but the demand has been light owing principally to competition of cheaper roofing materials.

The production of salt in California during 1939 amounted to 5,777 short tons, having a total value of $28,329 f.o.b. quarry and came from properties in Calaveras, El Dorado, Los Angeles, and Tuolumne counties. The 1939 figures showed a decrease in both amount and value over those of 1938 which were 6,871 tons at $30,281. Practically all the slate was crushed and used for roofing granules. The slate from Los Angeles County was sold as flagstone.

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Total Production of Slate in California.

A complete record of amount and value of slate produced in California follows:

Year	Squares	Value	Year	Squares	Value
1889	4,500	$18,089	1911		
1890	4,000	24,000	1915	1,000	$5,000
1891	4,000	24,000	1916		
1892	3,500	21,000	1920	8	80
1893	3,000	21,000	1921		
1894	1,800	11,700	1922	200	2,400
1895	1,350	9,450	1923		
1896	500	2,500	1926	(a)	7,371
1897	400	2,800	1927	[b]2,686	17,960
1898	400	2,800	1928	[b]4,075	31,263
1899	810	5,900	1929		
1900	3,500	26,250	1930 *	[b]8,220	71,347
1901	5,100	38,250	1931		
1902	4,000	30,000	1932 *	[b]8,234	55,182
1903	10,000	70,000	1933	[b]5,343	31,958
1904	6,000	50,000	1934	[b]5,065	24,245
1905	4,000	40,000	1935	(a)	40,912
1906	10,000	100,000	1936	(a)	49,818
1907	7,000	60,000	1937	(a)	32,572
1908	6,000	60,000	1938	[b]6,871	30,281
1909	6,961	45,660	1939	[b]5,777	28,327
1910	1,000	8,000			
			Total value		$1,105,115

* Annual details concealed under 'Unapportioned.'
[a] Quantity not shown as both 'squares' and 'tons' included.
[b] Tons.

MISCELLANEOUS STONE

Bibliography: State Mineralogist Reports XII-XXVIII (inc.), XXXI-XXXII, XXXV. Bulletin 38; also annual statistical bulletins from 1915 to date.

'Miscellaneous stone' is the name used throughout this report as the title for that branch of the mineral industry covering crushed rock of all kinds, paving blocks, sand and gravel, and pebbles for grinding mills. The foregoing are very closely related from the standpoint of the producer; therefore it has been found to be most satisfactory to group these items as has been done in recent reports of this Bureau. So far as it has been possible to do so, crushed rock production has been subdivided into the various uses to which the product was put. It will be noted, however, a very large percentage of the output has been tabulated under the heading 'Unclassified.' This is necessary because of the fact that many of the producers have no way of telling to what specific use their rock was put (or at least the proportions to each use) after they have quarried and sold the same to distributors and contractors.

In addition to amounts produced by commercial firms, both corporations and individuals, there is hardly a county in the State but uses more or less gravel and broken rocks on its roads. Of much of this, particularly in the country districts, there is no definite record kept.

During 1939 there was a total value of $10,316,787 for 'miscellaneous stone,' compared with $11,734,038 for 1938. As in the past Los Angeles County led in annual output of these products, its 1939 yield being worth $2,921,561; Alameda County second with an output worth $1,325,914; San Diego County third with an output worth $358,557; followed in turn by Contra Costa, Santa Cruz, Fresno, Sonoma, Napa, Riverside, Shasta, Mariposa, and Santa Clara counties.

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Paving Blocks.

There was a small output of paving blocks in California during 1939 coming from a single property in Sacramento County. The annual details are concealed under the 'Unapportioned' item so as not to reveal production of either operator.

The paving block industry has decreased materially of recent years, practically to the vanishing point, because of the increased construction of smoother pavements demanded by motor vehicle traffic. The blocks made in Solano County were of basalt; those from Sonoma are of basalt, andesite, and some trachyte, while those from Madera, Placer, Riverside, San Bernardino, and San Diego are of granite; and those from San Mateo County a sandstone.

The amount and value of paving block production, annually, since 1887 has been as follows:

Year	Amount M	Value	Year	Amount M	Value
1887	*10,000	$350,000	1913	6,364	$363,505
1888	10,500	367,500	1914	6,053	270,598
1889	7,303	297,236	1915	3,285	171,092
1890	7,000	245,000	1916	1,322	54,362
1891	5,000	150,000	1917	938	38,567
1892	*3,000	96,000	1918	372	17,000
1893	2,770	96,950	1919	27	1,350
1894	2,517	66,981	1920	63	3,155
1895	2,332	73,338	1921	4	280
1896	4,161	77,584	1922	72	3,924
1897	1,711	35,235	1923	15	880
1898	1,144	21,725	1924	11	935
1899	305	7,861	1925	27	1,350
1900	1,192	23,775	1926		
1901	1,920	41,075	1927	41	2,057
1902	3,502	112,437	1928	25	1,658
1903	4,854	134,642	1929		
1904	3,977	161,752	1930		
1905	3,408	134,347	1931	*66	5,900
1906	4,203	173,432	1932		
1907	4,604	199,347	1934	2	75
1908	7,660	334,780	1935		
1909	4,503	199,803	1938		
1910	4,434	198,916	1939	*9	439
1911	4,141	210,819			
1912	11,018	578,355	Totals	135,849	$5,326,071

* Figures for 1887-1892 (inclusive) are for Sonoma County only, as none are available for other counties during that period though Solano County quarries were then also quite active.

* Annual details concealed under 'Unapportioned.'

Grinding-Mill Pebbles.

The 1939 output of grinding-mill pebbles in California is combined under the 'Unapportioned' item to conceal the production of a single operator in Siskiyou County.

The amount and value of grinding-mill pebbles, annually, follows:

Year	Tons	Value	Year	Tons	Value
1915	340	$2,810	1928	372	$2,408
1916	20,232	107,567	1929		
1917	21,450	90,538	1930		
1918	8,628	61,268	1931	*166	1,225
1919	2,607	19,272	1932		
1920	2,104	17,988	1933	*25	211
1921	247	1,418	1934		
1922	1,571	7,628	1935	*300	3,018
1923	2,650	14,936	1936		
1924	434	2,969	1937	*961	8,356
1925	215	1,385	1938		
1926	102	612	1939	*960	4,800
1927	288	1,800		*	*
			Totals	63,652	$280,209

* Annual details concealed under 'Unapportioned.'

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Sand and Gravel.

A considerable part of the gravel excavated is passed through grading and washing plants, and the material over 2 inches in size is crushed. Much of it is utilized in concrete mixtures. Most of the gravel used for road surfacing and repairs as well as that for railroad ballast is creek-run or pit-run material which is spread upon the roads without undergoing any grading or washing.

The distribution of the 1939 output of sand and gravel by counties is given in the following table:

County	Tons	Value
Alameda[a]	1,723,581	$1,048,139
Amador	9,699	3,300
Butte	109,144	72,321
Calaveras	11,193	1,955
Colusa	78,427	19,714
Contra Costa[a]	120,781	39,788
Del Norte	32,000	7,250
Fresno	240,649	166,869
Glenn	150,671	54,591
Humboldt	226,262	81,556
Imperial	71,978	36,113
Inyo	6,730	4,230
Kern	133,695	78,193
Lake	50,580	21,790
Lassen	59,755	30,711
Los Angeles	4,543,883	1,751,443
Marin	36,718	13,222
Mariposa	18,786	15,476
Mendocino	176,179	44,821
Merced	141,460	81,569
Modoc	63,685	17,449
Mono	120,073	112,009
Monterey[a, b, c]	139,069	175,092
Nevada	36,006	21,410
Orange	118,650	68,552
Placer	27,322	20,320
Plumas	40,290	18,235
Riverside[a, b]	290,070	181,238
Sacramento[a]	297,385	217,111
San Bernardino	289,127	118,018
San Diego[a, b, c]	368,874	312,530
San Joaquin	210,004	117,664
San Luis Obispo	20,993	11,412
Santa Barbara	140,556	70,326
Santa Clara	258,050	173,559
Santa Cruz	568,463	290,017
Shasta	217,603	105,899
Siskiyou	56,866	37,186
Sonoma	495,145	269,168
Stanislaus	165,150	111,904
Tehama	6,484	4,656
Tulare	101,313	35,202
Ventura[a]	316,708	154,582
Yolo	147,735	54,676
Yuba	126,345	65,810
Alpine, El Dorado, Kings, Madera, Napa, San Benito, San Francisco, San Mateo[a], Sierra, Solano, Trinity, Tuolumne*	79,435	42,601
Totals	12,643,572	$6,392,617

* Combined to conceal the output of individual operators in each.
[a] Includes molding sand.
[b] Includes blast sand.
[c] Includes filter sand.

Included in the above is a total of 25,983 tons of molding sand valued at $53,890 coming from two properties in Contra Costa County; and one each in Alameda, Monterey, Riverside, Sacramento, San Diego, San Mateo, and Ventura counties. The 1939 yield showed a decrease compared with 1938 which was 32,691 tons worth $90,288.

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Crushed Rock.

To list the kinds and varieties of rock utilized commercially under this heading would be to run almost the entire gamut of the classification scale. Much depends on the kind available in a given district. Those which give the most satisfactory service are the basalts and other hard, dense, igneous rocks which break with sharp, clean edges. In many localities, river-wash boulders form an important source of such material. In such cases, combined crushing and washing plants obtain varying amounts of sand and gravel along with the crushed sizes. In Sacramento and Butte counties the tailings piles from the gold dredgers are the basis of like operations.

The values given are based on the selling price, f.o.b. cars, barges, or trucks, at the quarry.

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Crushed Rock Production, by Counties, for 1939

County	Macadam and ballast		Rubble and riprap		Concrete		Unclassified		Totals	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Alameda	67,046	$35,172	*	*	40,421	$30,523	[a]285,434	$189,634	392,901	$255,229
Butte	23,653	18,282	*	*	*	*	47,057	23,493	70,710	41,775
Contra Costa	125,115	97,571	11,781	$10,077	55,282	49,327	155,257	123,557	347,435	280,532
El Dorado	10,592	7,087	*	*	*	*			10,592	7,087
Fresno	*	*	*	*	71,815	72,055	4,087	5,529	75,902	77,584
Imperial					100	250	11,164	9,387	11,264	9,637
Kern	15,250	7,625			60,015	72,402			75,265	80,027
Lassen	24,000	12,000							24,000	12,000
Los Angeles	[b]215,948	77,498	423,930	503,149	245,281	97,215	[a, b]1,365,480	487,256	2,250,639	1,170,118
Marin	37,844	34,410	*	*	*	*	*	*	37,844	34,410
Mariposa	171,476	194,490					*	*	171,476	194,490
Merced	27,998	80,779			*	*	5,883	6,313	33,881	87,092
Plumas	11,000	8,250	5,353	3,293					16,353	11,543
Riverside	54,321	74,172	8,606	9,135	*	*			62,927	83,307
Sacramento	50,535	42,292	5,620	2,248	*	*	[b]118,736	87,952	174,891	132,492
San Bernardino	[b]10,980	5,490	235	350			149,039	50,105	160,254	55,945
San Diego			8,674	14,496	32,609	27,599	*	*	41,283	42,095
San Joaquin							50,677	28,705	50,677	28,705
San Mateo	*	*	*	*	*	*	12,868	5,913	12,868	5,913
Santa Cruz	17,000	7,977	2,122	5,881	*	*	*	*	19,122	13,858
Shasta			200	400			[d]514,540	149,540	514,740	149,940
Sierra	[b]3,000	750							3,000	750
Siskiyou	[c]250,879	62,720							250,879	62,720
Stanislaus	12,297	13,347			*	*	*	*	12,297	13,347
Tehama	40,300	40,300							40,300	40,300
Trinity	18,889	12,498							18,889	12,498
Tulare	18,681	9,341	1,446	890	*	*	*	*	20,127	10,231
Ventura					34,955	24,512	*	*	34,955	24,512
Yolo			2,760	1,380					2,760	1,380
Yuba	21,735	48,470	*	*			*	*	21,735	48,470
Fresno, Lake, Mono, Napa, Santa Clara, Tuolumne*	361,346	271,008							361,346	271,008
Alameda, Butte, El Dorado, Fresno, Marin, Napa, Nevada, Placer, San Benito, San Luis Obispo, San Mateo, Yuba*			221,703	242,037					221,703	242,037
Butte, El Dorado, Marin, Merced, Mendocino, Mono, Monterey, Napa, Orange, Riverside, Sacramento, San Mateo, Santa Clara, Santa Cruz, Stanislaus, Sonoma, Tulare, Tuolumne*					140,774	127,182			140,774	127,182
Marin, Mariposa, Napa, Orange[b], San Benito, San Diego[b], San Francisco, San Luis Obispo, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tulare, Tuolumne, Ventura, Yuba*							[b]366,435	295,956	366,435	295,956
Totals	1,589,885	$1,161,429	692,430	$798,336	681,252	$501,065	3,086,657	$1,463,340	6,050,224	$3,924,170

* Combined to conceal output of a single operator in each.
[a] Includes granules for roofing and terrazzo.
[b] Includes decomposed granite.
[c] Includes slag.
[d] Includes volcanic cinder.

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Miscellaneous Stone Production of California, by Years.

The amount and value, annually, of crushed rock (including macadam, ballast, rubble, riprap, and that for concrete), and sand and gravel, since 1893, follow:

Crushed Rock, Sand and Gravel, by Years

Year	Tons	Value	Year	Tons	Value
1893	371,000	$456,075	1917	8,069,271	$3,505,662
1894	661,900	664,838	1918	6,641,144	3,325,889
1895	1,254,688	1,095,939	1919	6,919,188	3,678,322
1896	960,619	839,884	1920	9,792,122	6,782,414
1897	821,123	600,112	1921	10,914,145	7,834,640
1898	1,177,365	814,477	1922	13,049,644	10,366,231
1899	964,898	786,892	1923	19,840,301	15,379,838
1900	789,287	561,642	1924	21,451,129	15,962,476
1901	530,396	641,037	1925	23,819,137	17,407,113
1902	2,056,015	1,249,529	1926	24,987,606	19,859,261
1903	2,215,625	1,673,591	1927	25,126,691	18,912,994
1904	2,296,898	1,641,877	1928	27,471,794	17,328,044
1905	2,624,257	1,716,770	1929	27,104,618	17,840,159
1906	1,555,372	1,418,406	1930	23,514,168	16,430,027
1907	2,288,888	1,915,015	1931	15,848,313	11,848,531
1908	3,998,945	3,241,774	1932	11,361,564	7,183,643
1909	5,531,561	2,708,326	1933	11,181,156	6,871,581
1910	5,827,828	2,777,690	1934	16,148,275	7,131,330
1911	6,487,223	3,610,357	1935	9,041,876	5,571,041
1912	8,044,937	4,532,598	1936	28,528,079	16,578,238
1913	9,817,616	4,823,056	1937	28,254,740	16,917,683
1914	9,288,397	3,960,973	1938	19,051,677	11,734,038
1915	10,879,497	4,609,278	1939	18,693,896	10,316,787
1916	9,951,089	4,009,590	Totals	477,206,058	$319,115,668

A comparison of the above table of annual production of these materials with the similar table for cement (see *ante*) reveals the fact that the important growth of the crushed rock and gravel business was coincident with the rapid development of the cement industry from the year 1902.

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CHAPTER FIVE

INDUSTRIAL MATERIALS

Bibliography: State Mineralogist Reports XII-XXXV (inc.). Bulletin 38. Min. & Sci. Press, Vol. 114, March 10, 1917. Spurr and Wormser, "Marketing of Metals and Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

The following mineral substances have been arbitrarily arranged under the general heading of 'Industrial Materials,' as distinguished from those which have clearly a defined classification, such as metals, salines, structural materials, etc.

These materials, many of which are mineral earths, are, with four or five exceptions, as yet produced on a comparatively small scale. The possibilities of development along several of these lines are large, and with increasing transportation and other facilities, together with steadily growing demands, the future for this branch of the mineral industry in California is promising. There is scarcely a county in the State but might contribute to the output.

Up to within the last few years, at least, production has been in the majority of instances dependent upon more or less of a strictly local market, and the annual tables show the results of such a condition, not only in the widely varying amounts of a certain material produced from year to year, but in widely varying prices of the same material.

The more important of these minerals thus far exploited, so far as shown by value of the output, are barytes, bentonite (fuller's earth), pottery clay, diatomite, dolomite, gypsum, limestone, mineral water, pumice and volcanic ash, pyrite, silica, and soapstone and talc.

In 1937 the mineral zircon was added to this group. The material mined was used as an abrasive and a refractory.

This group as a whole showed an increase in total value from $5,027,093 in 1938 to $5,622,449 in 1939.

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The following table gives the comparative figures for the amounts and value of industrial minerals produced in California during the years 1938 and 1939:

Substance	1938		1939		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Bentonite	9,374 tons	$113,164	11,284 tons	$138,854	25,690+
Clay (pottery)	304,564 tons	582,608	305,517 tons	611,599	28,991+
Dolomite	*	*	17,791 tons	40,391	* +
Feldspar	*	*	2,076 tons	12,510	* +
Gems		4,575		[b] 2,500	[b]2,075—
Gypsum	161,996 tons	327,821	219,671 tons	437,343	109,522+
Limestone	302,655 tons	729,149	316,029 tons	838,235	109,086+
Mineral water	26,900,959 gals.	853,998	16,678,741 gals.	735,988	118,010—
Pumice and volcanic ash	18,783 tons	105,207	41,109 tons	159,951	54,744+
Silica (sand and quartz)	63,167 tons	278,676	86,229 tons	349,074	70,398+
Soapstone and talc	28,346 tons	290,810	31,820 tons	372,078	81,368+
Sulphur	*	*	4,811 tons	73,741	* +
Unapportioned		[a]1,741,085		[b]1,850,185	109,100+
Total values		$5,027,093		$5,622,449	
Net increase					$595,356

* Included under 'Unapportioned.'

[a] Includes barite, carbon dioxide, diatomite, dolomite, feldspar, garnets, lithia, mica, pyrite, sillimanite-andalusite-kyanite group, sulphur, calcium silicate.

[b] Includes barite, calcium silicate, carbon dioxide, garnets (abrasive), lithia, pyrite, sillimanite-andalusite-kyanite group.

ASBESTOS

Bibliography: State Mineralogist Reports XII-XIX (inc.), XXII, XXVII (inc.), XXIX, XXXI-XXXII, XXXIV-XXXV. Bulletins 38, 91. Canadian Dept. of M., Mines Branch Bulletin 69. Min. and Sci. Press, April 10, 1920, pp. 531-533. Eng. & Min. Jour.-Press, Vol. 113, pp. 617-625, 670-677. Asbestology, Vol. 5, No. 7, July, 1927.

During 1939 there was no asbestos reported produced in California. In 1934 there was a small output of this material coming from a property in Napa County, and was used in roofing and plaster. The 1934 annual figures are combined under the 'Unapportioned' item to conceal the output of a single operator.

There are two varieties of asbestos, amphibole and serpentine. The most valuable and widely used is the serpentine or chrysotile variety. Chrysotile asbestos has short strong fibers varying in length from $\frac{1}{8}$ of an inch to three inches but mostly less than one inch. The value of the material varies greatly as to the length of the fiber; the longer demanding a premium. It is used as insulation for heat and electricity, in brake linings, steam packing, pipe coverings, in paint, water proof paper, roofing, cement, stucco, and plasters, in heat resisting textiles, as gloves, curtains, cord, etc.

The amphibole variety may be any one of several minerals of the amphibole group, the fibers of this type are weak and often brittle, and they are much more abundant but their uses are limited and value small; being restricted to heat insulation, chemical filters, and some times as a filler.

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Asbestos Production of California, by Years.

Total amount and value of asbestos production in California since 1887, as given in the records of this Bureau, are as follows:

Year	Tons	Value	Year	Tons	Value
1887	30	$1,800	1912	90	$2,700
1888	30	1,800	1913	47	1,175
1889	30	1,800	1914	51	1,530
1890	71	4,260	1915	143	2,860
1891	66	3,960	1916	145	2,380
1892	30	1,830	1917	136	10,225
1893	50	2,500	1918	229	9,903
1894	50	2,250	1919	*	
1895	25	1,000	1920	131	6,240
1896			1921	410	19,275
1897			1922	50	1,800
1898	10	200	1923	20	200
1899	30	750	1924	70	4,750
1900	50	1,250	1925	*	
1901	110	4,400	1926	25	1,650
1902			1927	*	
1903			1928	13	1,160
1904	10	162	1929	*	
1905	112	2,625	1930	219	6,175
1906	70	3,500	1931		
1907	70	3,500	1932	*	
1908	70	6,100	1934	309	3,274
1909	65	6,500	1935		
1910	200	20,000	1936		
1911	125	500	Totals	3,392	$145,984

* Annual details concealed under 'Unapportioned.'

BARITE

Bibliography: State Mineralogist Reports XXII, XIV, XV, XVII, XXI-XXVIII (inc.), XXXIV, XXXV. Bulletins 38, 87. Eng. & Min. Jour.-Press, Vol. 114, p. 109, July 15, 1922; Vol. 115, pp. 319-324, Feb. 17, 1923. U. S. Bureau of Mines, Inform. Circ. 6221, 6223.

During 1939 the barite produced in California came from two properties, one each in Mariposa and Nevada counties, the annual details being concealed in the 'Unapportioned' item so as not to reveal the output of either operator. This material was consumed in the manufacture of lithopone, a heavy-gravity oil-well drilling-mud, fillers, and barium chemicals.

Commercial production of barite in California for 1938 and 1939 amounted to a total of 66,228 short tons valued at $396,218 f.o.b. rail shipping point.

Barite's largest use in the United States is in the manufacture of lithopone, which is a chemically-prepared white pigment containing approximately 70% barium sulphate and 30% zinc sulphide. This is one of the principal constituents of 'flat' wall paints. Other important uses for barite, after washing and grinding, are as an inert pigment and filler in paint, paper, linoleums, oilcloth and rubber manufacture, and in the preparation of a number of chemicals including barium binoxide, carbonate, chloride, nitrate, the sulphate precipitated, or 'blanc fixe,' and in medicine.

The Tariff Act of 1930 placed a duty on foreign imported barite ore, crude or unmanufactured, of $4 per ton; ground or otherwise manufactured, of $7.50 per ton.

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Present (May 30, 1940) quotations for barite (93% $BaSO_4$) vary from $6.00 to $7.00 per ton, crude, f.o.b. rail shipping point. Most barite has to be washed and acid treated to remove iron stains or other impurities before being suitable for paint use.

Known occurrences of this mineral in California are located in Inyo, Los Angeles, Mariposa, Monterey, Nevada, San Bernardino, Shasta, Santa Barbara and Tulare counties. The deposit at El Portal, in Mariposa County, has given the largest commercial production to date, in part witherite (barium carbonate, $BaCO_3$). Witherite has also been found in Shasta County, but no shipments have yet been made from the deposit.

Total Barite Production of California.

The first recorded production of barite in California, according to the statistical reports of the State Mining Bureau, was in 1910. The annual figures are as follows:

Year	Tons	Value	Year	Tons	Value
1910	860	$5,640	1925		
1911	309	2,207	1926	4,978	$38,165
1912	564	2,812	1927	17,993	90,617
1913	1,600	3,680	1928	13,406	55,888
1914	2,000	3,000	1929	26,796	168,829
1915	410	620	1930	19,783	133,107
1916	1,606	5,516	1931	27,832	156,647
1917	4,420	25,633	1932	8,507	49,409
1918	100	1,500	1933	8,405	49,595
1919	1,501	18,065	1934	21,769	125,514
1920	3,029	20,795	1935	22,979	133,810
1921	901	4,809	1936		
1922	3,370	18,925	1937*	41,882	245,392
1923	2,925	16,058	1938		
1924			1939*	66,228	396,218
			Totals	304,153	$1,772,461

* Annual details concealed under 'Unapportioned.'

BENTONITE (Fuller's Earth)

Bibliography: State Mineralogist Reports XIV, XVII, XVIII, XXI, XXIII, XXV-XXVI (inc.), XXXIV. Bulletins 83, 91. U. S. Bureau of Mines, Bulletin 71, Technical Paper 609. Eng. & Min. Jour.-Press, Vol. 121, pp. 837-842, May 22, 1926.

During 1939 there was produced and shipped in California, 11,284 short tons of bentonite (fuller's earth) valued at $138,854 from eleven properties—seven in San Bernardino, two in Kern, and one each in Inyo and San Benito counties. In 1939 output, as compared with that of 1938 showed an increase in amount and value, which was 9374 tons, worth $113,164.

Previous to 1931 the Division of Mines classed this material under the heading of 'fuller's earth,' but it was thought advisable to change the name to bentonite, owing to the fact that much bentonite is employed in uses that can not be classed as fuller's earth and therefore had been classified in these reports under pottery clay. This was somewhat confusing. Bentonite is the name commonly applied to the clays of the montmorillonite and halloysite group ('rock soap').

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Fuller's earth includes many kinds of unctuous clays. It is usually soft, friable, earthly, nonplastic, white and gray to dark green in color, and some varieties disintegrate in water. Production has come mainly from Calaveras and Solano counties, with other deposits noted also in Riverside, Fresno, Inyo and Kern counties.

The Tariff Act of June 21, 1930, placed a duty of $1.50 a ton on foreign produced imported fuller's earth.

Bentonite Production of California, by Years.

Bentonite including a small amount of fuller's earth was first produced commercially in this State in 1899, and the total amount and value of the output since that time are as follows:

Year	Tons	Value	Year	Tons	Value
1899	620	$12,400	1920	600	$6,000
1900	500	3,750	1921	1,185	8,295
1901	1,000	19,500	1922	6,606	48,756
1902	987	19,246	1923	3,650	55,125
1903	250	4,750	1924	5,290	67,295
1904	500	9,500	1925	5,280	91,842
1905	1,344	38,000	1926	23,552	250,192
1906	440	10,500	1927	13,018	154,764
1907	100	1,000	1928	53,232	501,743
1908	50	1,000	1929	15,541	170,563
1909	459	7,385	1930	12,522	177,964
1910	340	3,820	1931	13,960	222,583
1911	466	5,294	1932	4,295	57,670
1912	876	6,500	1933	4,605	60,621
1913	460	3,700	1934	6,168	69,325
1914	760	5,928	1935	10,204	68,372
1915	692	4,002	1936	10,185	165,131
1916	110	550	1937	8,425	140,261
1917	220	2,180	1938	9,374	113,164
1918	37	333	1939	11,284	138,854
1919	385	3,810	Totals	212,671	$2,067,579

CALCIUM SILICATE

Bibliography: State Mineralogist Report XXXIV, Mining and Metallurgy: Oct., 1935.

During 1938 there were commercial shipments of calcium silicate reported in California, coming from two properties in Kern County. The annual details are concealed in the 'Unapportioned' item so as not to reveal the output of either operator.

The first commercial production of wollastonite was made in 1933 from a deposit operated by John T. Thorndyke in the Radamacher District in Kern County, and was shipped from Code's Siding to Los Angeles, where it is used to manufacture mineral wool. This was done by a new process in an electric furnace where the material is melted without the use of a flux and then blown to a fine fiber or wool by compressed air from jets. Mineral wool is an excellent insulating material for sound, heat and cold, and the manufacturer expects to use large quantities in proposed steel houses. This material, also, can be used in the manufacture of unbreakable glass. Experiments now being conducted by Mr. A. M. M. Russell, Testing Engineer of the State Harbor Commissioners, indicate that wollastonite should be a valuable addition to concrete.

Pyroxene is a silicate of calcium and magnesium and is found in crystalline limestone near the contact with intrusive igneous rocks

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and in basic igneous rocks such as gabbros. It is white to various shades of green, brown to black, having a hardness of 5 to 6 and a specific gravity 3.2 to 3.6.

Wollastonite is a calcium metasilicate ($CaSiO_3$) and usually found in crystalline limestone at the contact with intrusive igneous rocks. It is a white to gray mineral, having a hardness of $4\frac{1}{2}$ to 5 and a specific gravity of about 2.9.

Calcium silicate from 1934 to 1936 was classed in these California mineral production reports as wollastonite.

CARBON DIOXIDE GAS

Bibliography: State Mineralogist Report XII.

Carbon dioxide gas was first produced commercially in California in 1894. This material came from a drift on the 575 level of the Santa Isabel shaft of the New Almaden Quicksilver mine at Almaden, Santa Clara County. The drift was bulkheaded and a pipe was placed through the bulkhead for the gas to be drawn off, it then being compressed into cylinders and used in the manufacture of soda water.

In 1933 carbon dioxide gas was again produced, this time from wells drilled near Niland, Imperial County. On November 1, 1934, a dry-ice plant was put into operation for condensation of the carbon dioxide produced from the above wells. During 1939 there were two companies producing carbon dioxide from wells near Niland and one company in Mendocino County produced from springs near Ukiah. The 1938 figures are combined under the 'Unapportioned' item to conceal the output of either operator.

Carbon Dioxide Gas Production in California, by Years

Year	M cubic feet	Value
1894	80	$4,072
1895	800	12,000
1896	81	1,300
1897		
1933		
1934	15,440	1,822
1935		
1936	89,777	64,787
1937		
1938		
1939	131,189	13,799
Totals	237,367	$97,780

*Annual details concealed under 'Unapportioned.'

CLAY (Pottery)

Bibliography: State Mineralogist Reports I, IV, IX, XII-XV, XVIII-XXVIII (inc.), XXX-XXXIII (inc.), XXXV. Bulletins 38, 99. Preliminary Report No. 7. U. S. Bureau of Standards, Tech. Paper No. 262.

At one time or another in the history of the State, pottery clay has been mined in thirty-four of its counties. Of these, 23 contributed in 1939. In this report, 'pottery clay' refers to all clays used in the manufacture of red and brown earthenware, china and sanitary ware, flower pots, floor, faience and ornamental tiling, architectural terra

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cotta, sewer pipe, drain and roof tile, etc., and the figures for amount and value are relative to the crude material at the pit, without reference to whether the clay was sold in the crude form or was immediately used in the manufacture of any of the above finished products by the producer. It does not include clay used in making brick and hollow building blocks.

There are many other important uses for clay besides pottery manufacture. Among these may be enumerated paper, cotton goods, and chemicals. Clays of the montmorillonite and halloysite group ('rock soap') are being utilized successfully in the manufacture of soaps and for filtering oils and as oil-well drilling mud, also as an earth filler in irrigating ditches which run through porous ground.

During 1939 there was a total of 57 properties in 23 counties which reported an output of 307,517 short tons of pottery clay valued at $611,599 f.o.b. rail-shipping point for the crude material, as compared with 54 properties in 22 counties producing 304,564 tons worth $582,608 in 1938.

Because of the fact that a given product often requires a mixture of several different clays, and that these are not all found in the same pit, it is necessary for most clay-working plants to buy some part of their raw materials from other localities. For these reasons, in compiling the clay industry figures much care is required to avoid duplications. So far as we have been able to segregate the figures, from the data sent in by the operatives, we have credited the clay output to the counties from which the raw material originated; and have deducted tonnages used in brick manufacture, as bricks are classified separately, herein.

A tabulation of the direct returns from the producers, by counties, for the year 1939 is shown herewith:

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Pottery Clay in 1939

County	Tons	Value	Used in the manufacture of
Alameda	10,434	$17,073	Roofing, floor, and mantel tile; chimney, drain, and sewer pipe. Prepared clay and various.
Amador	[a]37,780	64,147	Architectural terra cotta; fire clay and refractories; chimney, drain and sewer pipe; floor, mantel, and roofing tile; art pottery; electrical porcelain; and various.
Kern	[b]23,213	32,373	Floor and fancy tile, sanitary ware, art pottery, China, and oil-well drilling-mud.
Los Angeles	17,836	46,272	Red earthenware; chimney, drain and sewer pipe; vents; floor, mantel, and roofing tile; art pottery; and various.
Orange	25,599	108,738	Architectural terra cotta; conduits and segment blocks; electrical, porcelain, and chinaware; refractories; vents; drain, floor, and mantel tile; art pottery; and various.
Placer	65,322	91,081	Architectural terra cotta; chimney, drain and sewer pipe; faience; floor, mantel, and roofing tile; red earthenware; electrical porcelain; sanitary ware; and various.
Riverside	59,030	115,120	Conduit, sewer, and drain pipe; red earthenware; faience, floor, mantel, and roofing tile; and various.
San Bernardino	8,924	44,008	Roofing, floor and mantel tile; drain and sewer pipe; red earthenware; refractories; fire-sand and various.
San Diego	5,162	5,386	Drain and sewer pipe; floor, mantel and roofing tile; etc.
Calaveras, Contra Costa, Fresno, Humboldt, Marin, Sacramento, San Joaquin, San Luis Obispo [b], Santa Barbara, Santa Clara, Sonoma, Stanislaus, Sutter, Ventura [b*]	52,217	87,401	Oil-well drilling-mud. Drain, roofing, and mantel tile; saggers; electrical porcelain; refractories; red earthenware; garden furniture; oil-well drilling-mud; sewer, drain, and conduit pipe; prepared clay, light weight aggregate; and various.
Totals	305,517	$611,599	

[a] Includes firesand.
[b] Includes clay and shale used for oil-well drilling-mud.
[*] Combined to conceal the output of single operators in each.

POTTERY CLAY PRODUCTS

The value of various pottery clay products manufactured in California during 1939 totaled $11,320,683, compared with $10,437,383 in 1938. The distribution for 1939 is shown in the following tabulation:

Product	Number producers	Tons	Value
Architectural terra cotta	4	3,440	$300,247
Chimney pipe and flue lining	10	8,065	295,945
Drain tile	18	7,822	127,310
Roofing tile	18	32,590	628,713
Floor, faience, mantel and handmade tile	25	----------	2,655,320
Sewer pipe	8	52,240	1,361,489
Red earthenware	5	----------	212,525
Stoneware and chemical stoneware	6	----------	464,118
Chinaware	5	----------	1,619,064
Electrical porcelain	5	----------	158,725
Sanitary ware and plumbing fixtures	6	----------	2,383,702
Garden pottery and furniture	4	----------	111,845
Art pottery	4	----------	207,669
Conduit pipe	4	3,775	88,257
Fire clay and high temperature cement	7	9,446	127,217
Specialties	4	----------	52,943
Miscellaneous: Gas stove vents, grog, tank backs, clay shapes, glazed blocks, ceramic vents, light aggregate, specialties, etc.	17	----------	525,593
Total value	----------	----------	$11,320,683

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Pottery Clay Production of California, by Years.

Amount and value of crude pottery clay output in California since 1887 are given in the following table:

Year	Tons	Value	Year	Tons	Value
1887	75,000	$37,500	1914	179,948	$167,552
1888	75,000	37,500	1915	157,866	133,724
1889	75,000	37,500	1916	134,636	146,538
1890	100,000	50,000	1917	166,298	154,602
1891	100,000	50,000	1918	112,423	166,788
1892	100,000	50,000	1919	135,708	245,019
1893	24,856	67,284	1920	203,997	440,689
1894	28,475	35,073	1921	225,120	362,172
1895	37,660	39,685	1922	277,232	473,184
1896	41,907	62,900	1923	376,863	697,841
1897	24,592	30,290	1924	417,928	651,857
1898	28,947	33,747	1925	537,587	674,376
1899	40,600	42,700	1926	801,461	806,509
1900	59,636	60,956	1927	867,419	872,661
1901	55,679	39,144	1928	887,807	1,394,950
1902	67,933	74,163	1929	839,949	1,127,527
1903	90,972	99,907	1930	938,586	795,517
1904	84,149	81,952	1931	332,680	408,931
1905	133,805	130,146	1932	167,284	204,890
1906	167,267	162,283	1933	141,629	211,711
1907	160,385	254,454	1934	190,510	245,900
1908	208,042	325,147	1935	240,014	377,969
1909	299,424	465,647	1936	382,823	646,920
1910	249,028	324,099	1937	354,669	705,200
1911	224,576	252,759	1938	304,564	582,608
1912	199,605	215,683	1939	305,517	611,599
1913	231,179	261,273			
			Totals	12,664,135	$16,639,026

DIATOMITE (Diatomaceous Earth)

Bibliography: State Mineralogist Reports II, XII-XV (inc.), XVII-XXVIII (inc.), XXXI, XXXIII, XXXV. Bulletins 38, 67, 91. Am. Inst. Min. Eng., Bull. 104, Aug. 1915, pp. 1539-1550. U. S. Bur. of Mines, Rep. of Investigations: Serial No. 2341, Jan. 1923. Eng. & Min. Jour.-Press, Vol. 115, pp. 1152-1154, June 30, 1923.

Diatomite, also known as diatomaceous earth, infusorial earth, tripolite and kieselguhr, is very light (when dry a cubic foot weighs 18 to 20 pounds) and extremely porous, chalk-like material composed of pure silica (chalk, being calcareous) which has been laid down under water and consists of the remains of microscopical infusoria and diatoms. The former are animal remains, and the latter are from plants.

The most important deposits in California thus far known are located in Los Angeles, Monterey, Orange, San Luis Obispo, and Santa Barbara counties. The diatomaceous earth of marine origin has proved of superior quality for filtration uses which bring the higher prices. Infusorial or diatomaceous earths are also found in Fresno, Kern, Plumas, San Benito, San Bernardino, San Joaquin, Shasta, Sonoma, and Tehama counties.

As about 70 per cent of the California output is from a single operator, we have concealed the exact figures under the 'Unapportioned' item in the State and county totals. There were three operators during 1939, one each in Los Angeles, Monterey and Santa Barbara counties. The shipments during the year showed an increase in total tonnage and value compared with 1938.

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The material shipped was utilized for insulation of both heat and sound, filtration, paint, pigment, cement admixture, fillers, abrasives and for clarification of gasoline and kerosene.

Total Production of Diatomite in California.

The first recorded production of these materials in California occurred in 1889; total amount and value of output, to date, are as follows:

Year	Tons	Value	Year	Tons	Value
1889	39	$1,335	1915	12,400	$62,000
1890			1916	15,322	80,649
1891			1917	24,301	127,510
1892			1918	35,963	189,459
1893	50	2,000	1919	40,200	217,800
1894	51	2,040	1920	60,764	1,056,260
1895			1921		
1896			1922	*90,739	1,016,675
1897	5	200	1923		
1898			1924	*193,064	5,729,736
1899			1925		
1900			1926		
1901			1927	*275,403	1,995,923
1902	422	2,532	1928		
1903	2,703	16,015	1929		
1904	6,950	112,282	1930	*300,017	4,848,661
1905	3,000	15,000	1931		
1906	2,430	14,400	1932		
1907	2,531	28,948	1933	*203,228	3,104,154
1908	2,950	32,012	1934		
1909	500	3,500	1935		
1910	1,843	17,617	1936	*290,908	4,243,572
1911	2,194	19,670	1937		
1912	4,129	17,074	1938	*	*
1913	8,645	35,968	1939	*	*
1914	12,840	80,350			
			Totals	1,593,591	$22,933,557

* Annual details concealed under 'Unapportioned.'

DOLOMITE

Bibliography: State Mineralogist Reports XV, XVII, XXVII, XXVIII, XXXI, XXXIII-XXXIV.

The 1939 output of dolomite in California came from one property each in Inyo, Los Angeles, Monterey, San Benito, and Tuolumne counties and amounted to a total of 17,791 tons valued at $40,391. Also not included in the above figures was a tonnage of dolomite burnt for lime, which is included with the lime figures. The 1939 production showed an increase in amount and value as compared with that of 1938.

The material shipped was utilized for steel-furnace flux and refractories, plaster, stucco dash-coat, terrazo, artstone, for the manufacture of CO_2, and mineral wool.

Dolomite Production of California, by Years.

Previous to the 1915 statistical report of the State Mining Bureau, dolomite was included under limestone, as the two minerals are closely related chemically; but since dolomite, as such, has been found to have certain distinctive applications, we here give it a separate classification.

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Amount and value of the output of dolomite, annually, have been as follows:

Year	Tons	Value	Year	Tons	Value
1915	4,192	$14,504	1928	38,379	$85,342
1916	13,313	46,566	1929	58,644	156,928
1917	27,911	66,416	1930)*	66,564	161,245
1918	24,560	79,441	1931)		
1919	24,502	67,953	1932	35,275	40,956
1920	42,388	132,791	1933	54,456	176,575
1921	31,195	99,155	1934)*	108,645	304,984
1922	52,409	114,911	1935)		
1923	69,519	142,615	1936	25,807	63,102
1924	28,843	71,271	1937	12,371	24,632
1925	42,852	104,900	1938	4,363	18,339
1926	68,640	119,313	1939	17,791	40,391
1927	45,976	79,442	Totals	998,595	$2,211,763

*Annual details concealed under 'Unapportioned.'

FELDSPAR

Bibliography: State Mineralogist Reports XV, XVII-XXVIII (inc.), XXX, XXXI, XXXIV-XXXV. Bulletins 67, 91. U. S. Bureau of Mines, Bulletin 92. Eng. & Min. Jour.-Press, Vol. 115, pp. 535-538, Mar. 24, 1923.

The 1939 output of feldspar in California came from two properties in San Diego County and one in Fresno County and amounted to a total of 2,076 short tons valued at $12,510. The 1939 production was an increase in amount value as compared with 1,378 tons worth $6,970 in 1938.

The requirements of the pottery trade demand that in general the percentage of free silica associated with the feldspar be less than 20 per cent, and in some cases the potters specify less than 5 per cent. An important factor, also, is the iron-bearing minerals frequently present in pegmatites and granites, such as biotite (black mica), garnet, hornblende and black tourmaline. Feldspar for pottery uses should be practically free of these. The white, potash-mica, muscovite, is not particularly objectionable except that being in thin, flexible plates, it does not readily grind to a fineness required for the feldspar. It is also used in the manufacture of glass, enamel and sanitary ware, in soaps and abrasives, and as a binder for abrasive wheels, etc., all of which have similar specifications to that for pottery.

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Total Feldspar Production in California.

Total amount and value of feldspar production in California since the inception of the industry are given in the following table, by years:

Year	Tons	Value	Year	Tons	Value
1910	760	$5,720	1926	7,300	$56,400
1911	740	4,560	1927	10,932	86,101
1912	1,382	6,180	1928	14,628	93,745
1913	2,129	7,850	1929	13,327	78,404
1914	3,530	16,565	1930	5,014	35,654
1915	1,800	9,000	1931	4,795	59,921
1916	2,630	14,350	1932	2,294	15,988
1917	11,792	46,411	1933		
1918	4,132	22,061	1934 *	2,655	30,611
1919	1,272	12,965	1935	3,265	21,855
1920	4,518	26,189	1936	3,430	24,959
1921	4,349	28,343	1937	2,686	10,930
1922	4,587	37,109	1938	1,378	6,970
1923	11,100	81,800	1939	2,076	12,510
1924	9,055	68,112			
1925	8,165	59,615	Totals	146,711	$980,883

* Annual details concealed under 'Unapportioned.'

FLUORSPAR

Bibliography: State Mineralogist Reports XVII, XVIII, XXIV, XXVI. Bulletins 67, 91. Eng. & Min. Jour.-Press, Vol. 177, pp. 489-492, Mar. 22, 1924.

During 1939 there was no commercial production of fluorspar reported in California.

The 1937 output of fluorspar came from a single property in San Bernardino County. The annual details are combined under the 'Unapportioned' item to conceal the output of the operator. This material was shipped to steel mills to be used as a flux. The combined production of 1933 and 1934 amounted to a total of 227 tons worth $3,631.

Fluorspar, or calcium fluoride, CaF_2, is one of the most important nonmetallic minerals from an industrial standpoint. About 80 per cent of the commercial mineral is prepared in the 'gravel' form and utilized as a flux in the manufacture of steel, for which use no substitute has yet been found.

In California deposits have been reported in Los Angeles, Mono, Riverside and San Bernardino counties. A previous commercial production was made in 1917-1918, when a total of 79 tons valued at $991 was shipped from Riverside County.

Present quotations (Metal and Mineral Markets) are: not less than 85 per cent CaF_2 and not over 5 per cent SiO_2, $21 per ton; No. 2 lamp, $21 per ton.

GARNET (Abrasive)

During 1939 there was a shipment of abrasive garnets as a by-product from a tungsten mine near Bishop in Inyo County. This was the first commercial production reported in California. The exact figures are concealed under the 'Unapportioned' item so as not to reveal the output of a single operator.

Most garnets are utilized on paper and cloth used for woodworking and shoe manufacture.

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Massive deposits of garnet have been noted in several places in California but little has been done to commercialize them owing to the lack of a market.

GEMS

Bibliography: State Mineralogist Reports II, XIV, XV, XVII, XVIII, XX, XXI-XXVIII (inc.), XXX-XXXII (inc.), XXXIV-XXXV. Bulletins 37, 67, 91. U. S. G. S., 'Mineral Resources of the U. S.'; Bull. 603, p. 208. Bull. Dept. Geo. Univ. of Cal., Vol. 5, pp. 149-153, 331-380. Am. Jour. Sci., Vol. 31, p. 31.

The production of gem materials in California has been somewhat irregular and uncertain since 1911. The compilation of complete statistics is difficult owing to widely-scattered places at which stones are gathered and marketed, for the most part in a small way. The gem material reported mined and sold in California during 1939 had a total value of $2,500. This output came from Contra Costa, Fresno, Imperial, Modoc, Napa, and San Diego counties and consisted of jaspar, kunzite, iceland spar, iridescent obsidian, tourmaline, onyx (chalcedony), topaz, and petrified wood. The above value was a decrease from that of 1938 which was worth $4,575.

Varieties of California's Gem Stones.

Diamonds have been found in a number of localities in California; but in every case, they have been obtained in stream gravels while working them for gold. The principal districts have been: Volcano in Amador County; Placerville, Smith's Flat and others in El Dorado County; French Corral, Nevada County; Cherokee Flat, Morris Ravine, and Yankee Hill, Butte County; Gopher Hill and upper Spanish Creek, Plumas County. The most productive district of recent years has been Cherokee in Butte County.

California *tourmalines* are decidedly distinctive in coloring and 'fire' as compared to foreign stones of this classification. The colors range from deep ruby to pink, and various shades of green, also blue.

One of our California gem stones, *benitoite,* has not been found elsewhere; and in but a single locality here: The Dallas Mine in San Benito County.

Kunzite, a gem variety of spodumene, was first found in the Pala district in San Diego County. It has thus far been found in only one locality (Madagascar) outside of California. It is of a lilac color, and is described in detail in Bulletin 37 of the State Mining Bureau.

Beryls of excellent fire and delicate colors are also obtained in the Pala district, of which the *aquamarine* (blue) and *morganite* (pink) varieties deserve special mention. Morganite, like kunzite, has thus far been found elsewhere only in Madagascar.

Californite, or 'California jade,' is a gem variety of *vesuvianite,* and is green or white in color. It is found in Butte, Fresno, and Siskiyou counties.

Stones of precious blue *topaz* of fine quality are being cut from crystals mined in northern San Diego County. They are associated with beryl and blue tourmaline.

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Some *rhodonite* has been mined in Siskiyou County, and used for decorative purposes, its value being included in the marble figures.

Garnets are found in a number of localities in California; the important yield of gems being *hyacinth* and *spessartite* varieties from San Diego County.

Chrysoprase has been produced in Tulare County.

Turquoise has been found in the desert section of San Bernardino County, but none produced commercially in recent years.

Sapphires have been reported found in San Bernardino and Riverside counties, but not as yet confirmed. A few have been found in stream gravels with diamonds in Butte County.

Rubies have been identified by the laboratory of the State Mining Bureau, occurring in limestone from the Baldy Mountains, San Bernardino County. Thus far no stones of commercial size have been taken out.

Total Production of Gem Materials in California.

The value of the gem output in California annually since the beginning of commercial production is as follows:

Year	Value	Year	Value
1900	$20,500	1921	$10,954
1901	40,000	1922	1,312
1902	162,100	1923	13,220
1903	110,500	1924	4,800
1904	136,000	1925	10,663
1905	148,500	1926	9,049
1906	497,090	1927	7,035
1907	232,642	1928	22,200
1908	208,950	1929	26,850
1909	193,700	1930	3,540
1910	237,475	1931	5,607
1911	51,824	1932	4,961
1912	23,050	1933	690
1913	13,740	1934	2,456
1914	3,970	1935	945
1915	3,565	1936	2,878
1916	4,752	1937	2,075
1917	3,049	1938	4,575
1918	650	1939	2,500
1919	5,425		
1920	36,056	Total value	$2,269,748

GRAPHITE

Bibliography: State Mineralogist Reports XIII, XIV, XV, XVII, XXVI (inc.), XXX, XXXIII, XXXV. Bulletins 67, 91. U. S. G. S., Min. Res., 1914, Pt. II.

Graphite (also called plumbago) has been produced from time to time in the State, coming principally from Sonoma and Los Angeles counties.

Occurrences of graphite have been reported at various times from Calaveras, Fresno, Imperial, Inyo, Los Angeles, Mendocino, San Bernardino, San Diego, Siskiyou, Sonoma and Tuolumne counties. From 1931 to 1933 there was a small production of graphite from a property in Los Angeles County.

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During 1939 no production of graphite was reported in California. In 1935 there was a small output of graphite coming from a single property in Los Angeles County. This material was used for experimental purposes. The annual details are concealed under the 'Unapportioned' item in order not to reveal the output of the single operator.

The principal value of graphite is on account of its infusibility and resistance to the action of molten metals. It is also largely used in the manufacture of electrical appliances, of 'lead' pencils, as a lubricant, as stove polish, paints, and in many other ways. Amorphous graphite, commonly carrying many impurities, brings a much lower price. For some purposes, such as foundry facings, etc., the low-grade material is satisfactory. Among the interesting uses for graphite is the prevention of formation of scale in boilers. The action is a mechanical one. Being soft and slippery, the graphite prevents the particles of scale from adhering to one another or to the boiler and they are thus easily removed.

Graphite Production of California, by Years.

According to the records of the State Mining Bureau, the graphite production of California, by years, has been as follows:

Year	Pounds	Value	Year	Pounds	Value
1901	128,000	$4,480	1923		
1902	84,000	1,680	1925	*76,000	$13,120
1903			1926		
1913	2,500	25	1927		
1914			1928		
1915			1931		
1916	29,190	2,335	1932	*156,000	1,950
1917			1933		
1918			1934		
1919	*770,000	37,225	1935	*	*
1920			1936		
1921					
1922	*624,000	26,160	Totals	1,869,690	$86,975

* Annual details concealed under 'Unapportioned,' on account of a single producer.

GYPSUM

Bibliography: State Mineralogist Reports XIV, XV, XVII, XVIII, XXII, XXIII, XXV-XXVIII (inc.), XXX, XXXI, XXX-XXXV (inc.). Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 223, 413, 430, 697. U. S. Bur. of Standards, Circular No. 281.

During 1939 there were shipments of gypsum in California amounting to 219,671 short tons valued at $437,343, coming from three properties each in Fresno and Kern counties and one each in Imperial, Monterey and Riverside counties. In addition to the above figures, there was a considerable amount of gypsum coming from Alameda County, which was obtained in the chemical process of reducing magnesium salts from bittern water with lime, the amount of which is not included in the above data, as the figures are already contained in those of magnesium salts and lime. The 1939 output was the largest annual recorded in this State and as compared with the 1938, which was 161,996 tons worth $327,821.

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Uses.

The most important use of gypsum from the quantity standpoint is in the calcined form where it is utilized in the manufacture of various hard-wall plasters and plaster board. As plaster of paris, it plays a very important part in surgical work. Approximately 2%, by weight, raw gypsum is added in the manufacture of Portland cement just before the final grinding. In this application, the gypsum acts as a retarder to the set of the cement. The use of gypsum tile for non-bearing fireproof partitions, stairway and elevator enclosures, and the protection of steel columns, girders and beams, has increased greatly.

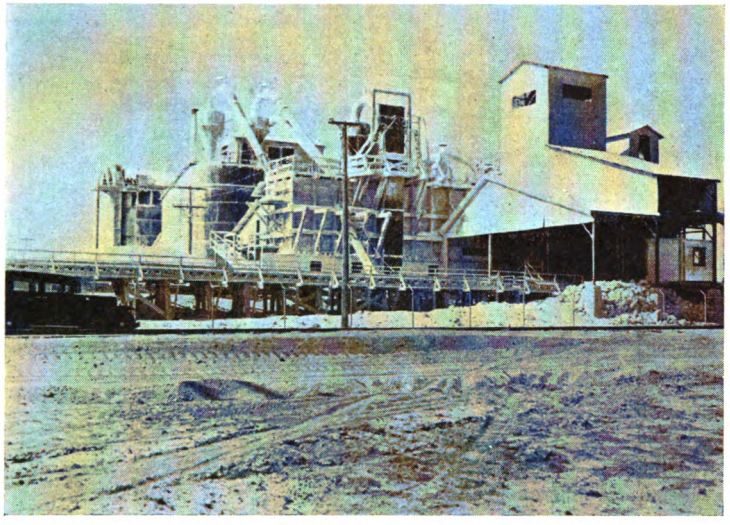

Photo by W. B. Tucker

Pacific Portland Cement Co. gypsum plant at Plaster City, Imperial County

Keene's cement is a gypsum product, calcined to complete dehydration, and an accelerator added such as alum, potassium sulphate, borax, aluminum sulphate.

Land plaster may be applied to the soil by drilling, or scattered in the hill, or it may be sowed broadcast, in quantities ranging from 200 to 500 pounds to the acre.

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Total Production of Gypsum in California.

Production of gypsum annually in California since such records have been compiled by this Bureau is as follows:

Year	Tons	Value	Year	Tons	Value
1887	2,700	$27,000	1914	29,734	$78,375
1888	2,500	25,000	1915	20,200	48,953
1889	3,000	30,000	1916	33,384	59,533
1890	3,000	30,000	1917	30,825	56,840
1891	2,000	20,000	1918	19,695	37,176
1892	2,000	20,000	1919	19,813	50,579
1893	1,620	14,280	1920	20,507	92,535
1894	2,446	24,584	1921	37,412	78,875
1895	5,158	51,014	1922	47,084	188,336
1896	1,310	12,580	1923	86,410	289,136
1897	2,200	19,250	1924	25,569	53,210
1898	3,100	23,600	1925	107,613	172,444
1899	3,663	14,950	1926	114,868	211,337
1900	2,522	10,088	1927	94,630	292,090
1901	3,875	38,750	1928	104,790	200,567
1902	10,200	53,500	1929	140,844	396,951
1903	6,914	46,441	1930	116,865	243,507
1904	8,350	56,592	1931	88,354	199,198
1905	12,859	54,500	1932	46,867	93,818
1906	21,000	69,000	1933	59,235	120,451
1907	8,900	57,700	1934	58,149	113,606
1908	34,600	155,400	1935	70,833	151,807
1909	30,700	138,176	1936	143,549	282,703
1910	45,294	129,152	1937	186,160	384,431
1911	31,457	101,475	1938	161,996	327,821
1912	37,529	117,388	1939	219,672	437,343
1913	47,100	135,050	Totals	2,421,044	$6,137,092

LIMESTONE

Bibliography: State Mineralogist Reports IV, XII-XV (inc.), XVII-XXXI (inc.), XXXIII-XXXV (inc.). Bulletins 38, 91. Oregon Agr. College Extension Bulletin 305. Eng. and Min. Jour.-Press, Vol. 120, pp. 249-253.

'Industrial' limestone was produced by twenty-two properties in twelve counties in California during 1939 to the amount of 316,029 short tons valued at $838,235, this being an increase in amount and value over the 1938 figures which were 302,655 tons worth $729,149. The 1939 yield came from four properties in El Dorado County; three each in San Bernardino, Santa Clara, and Santa Cruz counties; two in Tuolumne County; and one each in Fresno, Imperial, Inyo, Los Angeles, Riverside, San Luis Obispo and San Mateo counties.

The amount here does not include the limestone used in the manufacture of cement nor for macadam and concrete, nor of lime for building purposes; but accounts for that utilized as smelter and foundry flux, for glass and sugar making, and other special chemical and manufacturing processes. It also includes that utilized for fertilizers (agricultural 'lime'), 'roofing gravel,' paint and concrete filler, whiting for paint, putty, kalsomine, terrazzo, paving dust, chicken grit, carbon dioxide gas, 'paving compound,' facing dust for concrete pipe, also for rubber and magnesite mix. The material from Fresno County was marl; and that from San Mateo and Santa Clara counties was shells, dredged from San Francisco Bay, which were ground and used for agricultural purposes and poultry grit. Of the total 'industrial' limestone produced in 1939, approximately 94,396 tons valued at $346,584 was used for agricultural purposes and poultry grits.

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Distribution of the 1939 output of limestone was as follows:

County	Tons	Value
El Dorado	146,625	$320,212
San Bernardino	18,710	60,703
Santa Clara [b]	59,151	117,763
Santa Cruz	34,837	47,529
Fresno,[a] Imperial, Inyo, Los Angeles, Riverside, San Luis Obispo, San Mateo [b] and Tuolumne *	56,706	292,028
Totals	316,029	$838,235

* Combined to conceal the output of individual operators in each.

[a] Includes marl.

[b] Includes shells.

Limestone Production of California, by Years.

The following tabulation gives the amounts and value of 'industrial' limestone produced in California by years since 1894 when compilation of such records was begun by the State Mining Bureau. These tonnages consist principally of limestone utilized for flux, glass and sugar making, agricultural, chemical, and other special industrial purposes. That utilized in cement manufacture is not included:

Year	Tons	Value	Year	Tons	Value
1894	15,420	$19,275	1918	208,566	$456,258
1895	71,355	71,690	1919	88,291	248,145
1896	68,184	71,112	1920	90,120	298,197
1897	36,796	38,556	1921	75,921	305,912
1898	27,686	24,548	1922	84,382	282,181
1899	30,769	29,185	1923	143,266	348,464
1900	32,791	31,532	1924	219,476	582,660
1901	76,937	99,445	1925	319,977	494,525
1902	71,422	90,524	1926	108,795	367,501
1903	125,919	163,988	1927	699,790	663,957
1904	40,207	87,207	1928	127,895	397,935
1905	192,749	323,325	1929	168,315	557,617
1906	80,262	162,827	1930	169,477	508,751
1907	230,985	406,041	1931	177,268	560,699
1908	273,890	297,264	1932	168,950	487,788
1909	337,676	419,921	1933	207,371	487,712
1910	684,635	581,208	1934	198,057	461,139
1911	516,398	452,790	1935	227,214	496,054
1912	613,375	570,248	1936	295,792	661,757
1913	301,918	274,455	1937	351,755	830,562
1914	572,272	517,713	1938	302,665	729,149
1915	146,324	156,288	1939	316,029	838,235
1916	187,521	217,733			
1917	237,279	356,396	Totals	9,721,132	16,527,469

LITHIA

Bibliography: State Mineralogist Reports II, IV, XIV, XXI, XXX, XXXV. Bulletins 38, 67, 91.

During 1939 lithium salts were again produced in California; but coming from a single property, the figures are concealed under the 'Unapportioned' item. Starting with 1938, material came from the brines of Searles Lake in San Bernardino County at the plant of the American Potash and Chemical Corporation, in the form of sodium-lithium phosphate, and was the first output of this kind, previous production being the mineral lepidolite.

Lithia mica, lepidolite (a silicate of lithium and others), utilized in the manufacture of artificial mineral water, fireworks, glass, etc., has been mined in San Diego County since 1899, except between 1905 and 1915, though there was none shipped in 1923, 1925, 1929-1937

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(inc.). During 1930 there was a small amount of lepidolite mined in California, but none shipped. Some amblygonite, a lithium phosphate, is occasionally also obtained from pockets associated with the gem tourmalines.

Lithia minerals total production in the State has been as follows:

Year	Tons	Value	Year	Tons	Value
1899	124	$4,600	1920	10,046	$153,502
1900	440	11,000	1921	*1,365	20,781
1901	1,100	27,500	1922		
1902	822	31,880	1923		
1903	700	27,300	1924	109	2,269
1904	641	25,000	1925		
1905	25	276	1926		
1906			1927	*550	13,900
1915	91	1,365	1928		
1916	71	1,065	1929		
1917	880	8,800	1938	* 378	100,338
1918	4,111	73,998	1939		
1919	800	14,400	Totals	22,253	$517,974

* Annual details concealed under 'Unapportioned.'

MICA

Bibliography: State Mineralogist Reports II, IV, XXVI-XXVIII (inc.), XXX, XXXIII-XXXV (inc.). Bulletins 38, 67, 91. U. S. Geol. Surv., Bull. 740; Min. Res. of U. S. Eng. & Min. Jour.-Press, Vol. 115, pp. 55-60, Jan. 13, 1923.

Sericite, a fine-grained variety of muscovite, has been produced continuously since 1929 in California with the exception of 1934 and 1939. The 1938 output of mica came from a single property in Imperial County. The annual details are concealed in the 'Unapportioned' item so as not to reveal production of the individual operator. The material mined during the year was sericite. Sericite is used as a cheap grade of ground mica for roofing, as a refractory, foundry facing, and decorative material to imitate snow. A small amount of vermiculite, a hydrous mica, expanded by heating and then used as an insulating agent, was mined in 1936.

Classification and Uses.

Practically all marketable mica is of the muscovite or phlogopite varieties. There are three main commmercial classes: Sheet mica, including punch; splittings, and scrap. Sheet mica is used chiefly for electrical purposes and for glazing; splittings are made into built-up mica; scrap is ground to a powder. Mica to be classified as sheet must yield a rectangle of at least 1½ x 2 in., must split evenly and freely, be free from cracks, rulings, or plications, and reasonably free from inclusions of foreign matter, though stains of a nonconducting character are permissible for some uses. Ability to withstand heat and high electrical resistance have led to a wide application of sheet mica in the electrical industries. The electrical uses of sheet mica greatly exceed all others in quantity and value of the material used.

As a heat-resisting transparent medium, sheet mica has various uses. It is widely employed for stove windows, though this use has declined

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to a considerable extent. A hard and rigid mica that is nearly clear is best suited for stove fronts. High-grade stove mica commands a higher price than electrical mica, because for the most part larger sizes are demanded. Mica is also used in furnace and bake-oven sight-holes, heat screens, lamp chimneys, canopies and shades, particularly for gas mantels, and also for military lanterns and in lantern slides.

Its ability to withstand shocks and strains, combined with its transparency, has led to wide use in spectacles, drivers' helmets, smoke helmets, compass cards, gage fronts, and in windows subject to shock, as in the conning towers of warships. On account of its heat-resisting qualities, ground mica is used in railroad car axle packings, foundry facing in pipe and boiler coverings, in fireproof paints, and in rubber tires. Ground mica is used as a component in roofing, as a filler in rubber and other products, in foundry facing, calico printing and as a tire powder. It is used also in tinsel decorations, and as 'Santa Claus snow' for Christmas tree and window decorations. It is used as a lubricant for wooden bearings, and mixed with oil for metal bearings.

The vermiculite variety is any of several hydrous mica minerals which expand upon heating. In recent years they have become valuable as an insulating agent for both heat and sound, when being expanded it often takes on a gold or silver color and is in window decoration.

Production of mica in California has been as follows:

Year	Tons	Value	Year	Tons	Value
1902	50	$2,500	1934		
1903	50	3,800	1935		
1904	50	3,000	1936 *	3,833	$15,650
1929			1937		
1930 *	2,240	15,260	1938 *	4,969	31,751
1931			1939		
1932					
1933 *	1,957	13,963	Totals	13,149	$85,924

* Annual details concealed under 'Unapportioned.'

MINERAL PAINT

Bibliography: State Mineralogist Reports XII-XIX (inc.), XXI, XXII-XXVIII (inc.), XXXV. Bulletins 38, 91.

During 1939 no output of mineral paint was reported in California. In 1937 there was a small amount of mineral paint produced, which came from a single property each in Nevada, Placer and Yuba counties. The details are concealed under 'Unapportioned' so as not to reveal individual output. The material from Nevada and Yuba counties was a limonite and that from Placer County a sienna.

These materials have come from Alameda, Amador, Butte, Calaveras, Colusa, Los Angeles, Napa, Nevada, Placer, Riverside, Shasta, Sonoma, Stanislaus and Ventura counties. There are also other deposits that may have possible commercial value, but as yet there have been no commercial shipments from El Dorado, Imperial, Kern, Kings, Lake, Mendocino, San Diego, Siskiyou, Trinity and Yuba counties, in which they are found.

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Mineral Paint Production of California, by Years.

The first recorded production of mineral paint materials in the State was in the year 1890. The output, showing annual amount and value since that time, is given herewith:

Year	Tons	Value	Year	Tons	Value
1890	40	$480	1915	311	$1,756
1891	22	880	1916	643	3,960
1892	25	750	1917	520	2,700
1893	590	26,795	1918	728	4,738
1894	610	14,140	1919	1,780	17,055
1895	750	8,425	1920	779	8,477
1896	395	5,540	1921	446	4,748
1897	578	8,165	1922	1,620	13,277
1898	653	9,698	1923	1,049	11,773
1899	1,704	20,294	1924	532	5,234
1900	529	3,993	1925	669	6,969
1901	325	875	1926	569	5,846
1902	589	1,533	1927	919	9,592
1903	2,370	3,720	1928		
1904	270	1,985	1929	467	2,820
1905	754	4,025	1930	250	3,000
1906	250	1,720	1931		
1907	250	1,720	1932		
1908	335	2,250	1933		
1909	305	2,325	1935	570	5,550
1910	200	2,040	1936		
1911	186	1,184	1937	*	*
1912	300	1,800	1938		
1913	303	1,780			
1914	132	847	Totals	23,717	$227,648

* Annual details concealed under 'Unapportioned.'

MINERAL WATER

Bibliography: State Mineralogist Reports VI, XII-XVIII (inc.), XXI-XXIX (inc.), XXXI, XXXIII (inc.), XXXV. U. S. G. S., Water Supply Paper 338. Min. Res., 1914, 1916. 'Mineral Springs and Health Resorts of California,' by Dr. Winslow Anderson, 1890. U. S. Dept. of Agr., Bur. of Chem., Bulletin 91.

A widespread production of mineral water is shown annually in California. These figures refer to mineral water actually bottled for sale, or for local consumption. Water from some of the springs having a special medicinal value brings a price many times higher than the average shown, while in some cases the water is used merely for drinking purposes and sells for a nominal figure. Health and pleasure resorts are located at many of the springs. The waters of some of the hot springs are not suitable for drinking, but are very efficacious for bathing. From a therapeutic standpoint, California is particularly rich in mineral springs.

The commercial production of mineral water during 1939 amounted to 16,678,741 gallons valued at $735,988, as compared with 26,900,959 gallons worth $853,998 in 1938. The 1939 output came from springs on 42 properties in 19 counties and was distributed as follows:

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County	Gallons	Value
Lake	23,850	$7,100
Los Angeles	7,577,237	431,483
Napa	97,750	12,650
San Diego	141,745	5,394
Sonoma	53,860	6,949
Butte, Calaveras, Contra Costa, El Dorado, Fresno, Marin, Modoc, Placer, Riverside, San Benito, San Bernardino, San Francisco, San Luis Obispo, Siskiyou *	8,784,299	272,412
Totals	16,678,741	$735,988

* Combined to conceal the output of operators in each.

The production above tabulated came either from springs or artesian wells, and was bottled, in part with artificial carbonation, but mostly natural, and sold for drinking purposes. A large part was used in the preparation of soft drinks with flavors.

Mineral Water Production of California, by Years.

Mineral water was bottled for sale, at the Napa Soda Springs, Napa County, as early as 1856,[1] and at other springs in California, notably The Geysers, Sonoma County, also at early dates; but there are no figures available earlier than the year 1887. Amounts and values, annually, since that year are shown herewith:

Year	Gallons	Value	Year	Gallons	Value
1887	618,162	$144,368	1914	2,443,572	$476,169
1888	1,112,202	252,990	1915	2,274,267	467,738
1889	808,625	252,241	1916	2,273,817	410,112
1890	258,722	89,786	1917	1,942,020	340,566
1891	334,553	139,959	1918	1,808,791	375,650
1892	331,875	162,019	1919	2,233,842	340,117
1893	383,179	90,667	1920	2,391,791	421,643
1894	402,275	184,481	1921	3,446,278	367,476
1895	701,397	291,500	1922	4,276,346	486,424
1896	808,843	337,434	1923	5,487,276	616,919
1897	1,508,192	345,863	1924	8,159,211	818,726
1898	1,429,809	213,817	1925	12,115,072	1,230,455
1899	1,338,537	406,691	1926	14,074,877	1,171,550
1900	2,456,115	268,607	1927	16,644,423	1,487,183
1901	1,555,328	559,057	1928	25,049,002	1,304,969
1902	1,701,142	612,477	1929	27,032,083	2,040,615
1903	2,056,340	558,201	1930	37,354,111	2,870,663
1904	2,430,320	496,946	1931	26,164,331	1,347,860
1905	2,194,150	538,700	1932	19,031,224	1,495,988
1906	1,585,690	478,186	1933	15,650,406	719,746
1907	2,924,269	544,016	1934	19,882,436	1,071,197
1908	2,789,715	560,507	1935	16,659,254	940,333
1909	2,449,834	465,488	1936	19,348,513	777,899
1910	2,335,259	522,009	1937	18,309,729	1,130,810
1911	2,637,669	590,654	1938	26,900,959	853,998
1912	2,497,794	529,384	1939	16,678,741	735,988
1913	2,350,792	599,748			
			Totals	389,633,160	$34,626,589

[1] Cronise, T. F., The natural wealth of California, p. 182, 1868.

PHOSPHATES

Bibliography: State Mineralogist Report XXI. Bulletins 67, 91.

No commercial production of phosphates has been recorded from California, though occasional pockets of the lithium phosphate, amblygonite, Li (AlF) PO_4, have been found associated with the gem tourmaline deposits in San Diego County. Such production has been classified under lithia. During 1938, recovery began on a commercial scale of sodium-lithium phosphate at the plant of the American Potash and Chemical Corporation, at Searles Lake, San Bernardino County.

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However, the product is sold for its lithium content rather than the phosphate, hence we record it under Lithia.

PUMICE and VOLCANIC ASH

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII, XVIII, XXII-XXV (inc.), XXX-XXXII (inc.), XXXIV, XXXV. Bulletin 38. U. S. Bureau of Mines, I. G. 6560. (See 'Tufa.')

The production of pumice and volcanic ash in California during 1939, amounted to 41,109 short tons valued at $159,951. This output came from four properties in Siskiyou County; three in Inyo County; two each in Kern, Mono, and Napa counties; and one each in Amador, Modoc and San Luis Obispo counties. The 1939 figures showed an increase in both amount and value over those of 1938, which were 18,783 tons worth $105,207.

The material from Inyo, Modoc, Mono, Napa and Siskiyou counties was 31,481 tons of lump pumice, which was used in acoustic plaster, light-weight aggregate in concrete, for abrasive purposes, scouring bricks, and for chicken-house litter. That from Amador, Kern, Madera, and San Luis Obispo counties was 9,628 tons of volcanic ash, or tuff variety, and was employed in making soap, cleanser compounds, as a concrete filler in cement displacement, in asphalt, and as a carrier for dry agricultural sprays. The Kern County ash is going into the preparation of one of our popular and nationally advertised brands of cleanser compounds.

Pumice Production of California, by Years.

Commercial production of pumice in California was first reported to the State Mining Bureau in 1909, then not against until 1912, since which year there has been a small annual output, as indicated by the following table:

Year	Tons	Value	Year	Tons	Value
1909	50	$500	1925	5,319	$32,937
1910	----------	----------	1926	7,170	48,350
1911	----------	----------	1927	13,779	168,896
1912	100	2,500	1928	10,440	105,055
1913	3,590	4,500	1929	10,449	76,123
1914	50	1,000	1930	12,947	128,847
1915	380	6,400	1931	11,711	108,130
1916	1,246	18,092	1932	9,891	86,034
1917	525	5,295	1933	8,243	61,067
1918	2,114	28,669	1934	9,951	54,748
1919	2,388	43,657	1935	14,890	87,055
1920	1,537	25,890	1936	17,132	143,709
1921	406	6,310	1937	10,392	79,005
1922	613	4.248	1938	18,783	105,207
1923	2,936	16,309	1939	41,109	159,951
1924	4,919	33,404	Totals	213,060	$1,641,888

PYRITES

Bibliography: State Mineralogist Reports XVIII, XIX, XXII, XXV, XXVI, XXX, XXXV. Bulletins 38, 91. Min. and Sci. Press, Vol. 144, pp. 825, 840.

Pyrite, shipped in California during 1939 came from a single property in Shasta County and showed a decrease in both quantity and

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value from that of 1938. The annual details are placed under 'Unapportioned' to conceal the output of the individual operator.

This material was mostly used in the manufacture of sulphuric acid for explosives and fertilizer. Some iron sulphate had been produced previously and was utilized directly in the preparation of an agricultural fertilizer and insecticide. The sulphur content ranged up to 50.8% S.

This does not include the large quantities of pyrite, chalcopyrite, and other sulphides which are otherwise treated for their valuable metal contents. Some sulphuric acid is annually made as a by-product in the course of roasting certain tonnages of Mother Lode auriferous concentrates while under treatment for their precious metal values.

Pyrites Production in California, by Years.

The total recorded pyrites production in California to date is as follows:

Year	Tons	Value	Year	Tons	Value
1898	6,000	$30,000	1920	146,001	$530,581
1899	5,400	28,620	1921	110,025	473,735
1900	3,642	21,133	1922	151,381	570,425
1901	4,578	18,429	1923	148,004	555,308
1902	17,525	60,306	1924	124,214	517,835
1903	24,311	94,000	1925	129,500	528,550
1904	15,043	62,992	1926	100,896	466,088
1905	15,503	63,958	1927	130,910	564,823
1906	46,689	145,895	1928	90,566	400,627
1907	82,270	251,774	1929	79,169	363,717
1908	107,081	610,335	1930	39,958	194,228
1909	457,867	1,389,802	1931	25,402	131,174
1910	42,621	179,862	1932		
1911	54,225	182,954	1933	72,271	297,832
1912	69,872	203,470	1934		
1913	79,000	218,537	1935	157,129	547,754
1914	79,267	230,058	1936		
1915	92,462	293,148	1937	155,107	541,915
1916	120,525	372,969	1938		
1917	111,325	323,704	1939	127,604	452,901
1918	128,329	425,012			
1919	147,024	540,300	Totals	3,497,696	$12,884,751

* Annual details concealed under 'Unapportioned.'

SHALE OIL

Bibliography: State Mineralogist Report XIX. U. S. Geol. Surv., Bulletins 322, 729. U. S. Bur. of Mines, Bull. 210, Eng. and Min. Jour.-Press, Vol. 118, No. 8, pp. 290-292, Aug. 23, 1924. Chem. & Met. Eng., Vol. 32, No. 6, Feb. 1925. Min. Congress Jour., Dec. 1924.

Two plants on a more or less experimental scale operated for six years in California, with commercial production beginning in a small way in 1922. The product, in part, was sold for utilization as a flotation oil in metallurgical work, and part consumed as fuel at the plants. There has been no production reported since 1927.

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Shale Oil Production of California, by Years

Year	Barrels	Value
1922*		
1923	4,333	$44,262
1924*		
1925	8,688	55,240
1926*		
1927	8,819	9,998
1928		
Totals	21,840	$109,500

* Annual details concealed under 'Unapportioned.'

SILICA (Sand and Quartz)

Bibliography: State Mineralogist Reports IX, XIV, XV, XVII, XVIII, XX-XXVIII (inc.), XXXI-XXXIII (inc.), XXXV. Bulletins 38, 67, 91.

We combine these materials because of the overlapping roles of vein quartz which is mined for use in glass making and as an abrasive, and that of silica sand which, although mainly utilized in glass manufacture, also serves as an abrasive. Both varieties are also utilized to some extent in fire-brick manufacture.

We do not include under this heading such forms of silica as: quartzite, sandstone, flint, tripoli, diatomaceous earth, nor the gem forms of 'rock crystal,' amethyst, and opal. Each of these has various industrial uses, which are treated under their own designations.

The production of silica in California during 1939 amounted to 86,229 short tons valued at $349,074 f.o.b. rail shipping point, and came from two properties in Contra Costa County and one each in Orange, Riverside, and San Diego counties. The above was an increase in both amount and value over the output of 1938 which was 63,176 tons worth $278,676. The 1939 output consisted of 84,979 tons of glass sand and 1250 tons of vein or boulder quartz—and was the largest annual production of silica in this State. This is brought about by increased production of glass sand.

The glass sand came from Contra Costa, Orange and Riverside counties. For making the higher grades of glass, deposits in Contra Costa County are replacing the sand imported from Belgium. Belgium sand has displaced local material in the manufacture of sodium silicate ('water glass'). There are various deposits of quartz in California which could be utilized for glass making, but to date they have not been so used owing to the cost of grinding and the difficulty of preventing contamination by iron while grinding.

Silica sand has been produced in the following counties of the State: Alameda, Amador, Contra Costa, El Dorado, Imperial, Inyo, Los Angeles, Mariposa, Mono, Monterey, Orange, Placer, Riverside, San Diego, San Joaquin and Tulare, the chief centers being Contra Costa, Amador, Monterey and Los Angeles counties. The industry is of limited importance, so far, because of the fact that much of the available material is not of a grade which will produce first-class colorless glass; for such, it must be essentially iron-free. Even a fractional per cent of iron imparts a green color to the glass.

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The Tariff Act of June 21, 1930, placed a duty on sand, containing 95 per cent or more of *Silica* and not more than six-tenths of 1 per cent of oxide of iron and suitable for use in the manufacture of glass, of $2 per ton.

Total Silica Production in California.

Total silica production in California since the inception of the industry, in 1899, is shown below, being mainly sand:

Year	Tons	Value	Year	Tons	Value
1899	3,000	$3,500	1920	25,324	$96,793
1900	2,200	2,200	1921	10,569	49,179
1901	5,000	16,250	1922	9,874	31,016
1902	4,500	12,225	1923	7,964	30,420
1903	7,725	7,525	1924	6,808	35,006
1904	10,004	12,276	1925	12,498	96,780
1905	9,257	8,121	1926	30,010	104,317
1906	9,750	13,375	1927	24,636	94,762
1907	11,065	8,178	1928	14,814	66,679
1908	9,255	22,045	1929	18,686	79,210
1909	12,259	25,517	1930	17,802	71,380
1910	19,224	18,265	1931	43,330	182,769
1911	8,620	8,672	1932	33,997	136,324
1912	13,075	15,404	1933	70,329	266,520
1913	18,618	21,899	1934	70,432	296,643
1914	28,538	22,688	1935	70,835	297,272
1915	28,904	34,322	1936	77,830	310,278
1916	20,880	48,908	1937	84,313	348,987
1917	19,376	41,166	1938	63,167	278,676
1918	23,257	88,930	1939	86,229	349,074
1919	18,659	101,600	Totals	1,062,603	$3,744,151

SILLIMANITE-ANDALUSITE-KYANITE GROUP

Bibliography: State Mineralogist Reports XX, XXIII, XXIV, XXVII, XXXV. Bulletins 67, 91. Dana's Mineralogy. U. S. Geol. Surv., Prof. Paper 110. U. S. Bureau of Mines, Inform. Circ. 6255. Eng. & Min. Jour.-Press. Vol. 120, pp. 91-94, 1925. Amer. Mineralogist, June, 1924.

Sillimanite and andalusite are both aluminum silicates (Al_2SiO_5), having the same composition and formula, but with slightly different physical characteristics. Though both crystallize in the orthorhombic system, their crystal habits are different. A massive deposit of andalusite, found in Dry Creek Canyon in the White Mountains of the Inyo Range, in Mono County, is being mined by the Champion Spark Plug Company of Detroit, Michigan. The material is shipped East and utilized in the manufacture of porcelain for automobile spark plugs, for other high-tension electric insulators, laboratory ware and porcelain. Porcelain made from these minerals can be subjected to sudden and extreme changes in temperature without damage.

Kyanite is also an aluminum silicate (Al_2SiO_5), of the same chemical composition as andalusite and sillimanite, but crystallizing in the triclinic system. A deposit of kyanite is being mined in Imperial County, near Ogilby, by the Vitrefrax Corporation and shipments made to their refractory plant in Los Angeles.

Dumortierite, though differing somewhat in composition from the above, being a basic aluminum silicate ($HAl_8BSi_3O_{20}$), has proved similar in behavior in ceramic work so that it is now being mixed with

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andalusite for electrical porcelains. A deposit of this mineral in Nevada is being mined for that purpose. Occurrences of massive dumortierite are known in Imperial and San Diego counties in this State and there may yet be some commercial possibilities for them.

Total Sillimanite Group Production of California, by Years

Year	Tons	Value	Year	Tons	Value
1922 1923 1924 1925 1926 1927 1928 1929 1930*	4,584	$98,790	1931 1932*	1,244	$21,800
			1933 1934*	3,035	69,026
1926*	4,810	203,000	1935 1936*	3,112	89,214
1928*	4,276	76,000	1937 1938*	2,681	70,477
1930*	4,359	198,893	Totals	28,101	$827,200

* Annual details concealed under 'Unapportioned.'

SOAPSTONE and TALC

Bibliography: State Mineralogist Reports XII, XIV, XV, XVII-XXVII (inc.), XXX, XXXIII-XXXV (inc.). Bulletins 38, 67, 91. U. S. Bur. of Mines, Bulletin 213. Rep. of Investigations, Serial No. 2253, May, 1921.

The total output of talc and soapstone in California during 1939 amounted to 31,820 short tons valued at $372,078. This was an increase in both quantity and value over the 1938 figures, which were 28,346 tons valued at $290,810. Of the 1939 production, 30,241 tons were high-grade talc from Inyo and San Bernardino counties, which material was utilized mainly in toilet powders, paint, paper, for rubber manufacture, and some in ceramics. The remainder of 1,579 tons was soapstone and came from Butte, El Dorado, and Los Angeles counties. The 1939 figures for soapstone and talc are the largest of any year recorded in California.

The 'soapstone' grades were used mainly for roofing granules and as a filler in roofing paper and part also in magnesite cement.

It is reported that California talc has replaced to some extent imported talc in the toilet trade on the basis of quality. The largest production of talc in the United States comes from Vermont and New York and of massive soapstone from Virginia.

During 1939 imports of talc, steatite, etc., totaled 26,267 tons valued at $452,619, as compared with 22,127 tons worth $391,198 during 1938, according to the United States Bureau of Foreign and Domestic Commerce.

The Tariff Act of 1930 places a duty on talc, steatite or soapstone and French chalk, crude or unground, of one-fourth of one cent per pound.

Composition and Varieties.

Talc is hydrous magnesium silicate with the chemical formula $H_2Mg_3(SiO_3)_4$. It is also called soapstone and steatite. The term 'talc' properly includes all forms of the pure mineral, whereas 'steatite' denotes particularly the massive, compact variety, and 'soapstone'

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the impure, massive forms containing as low as 50% of talc. When pure, talc is soft, having a hardness of 1, but impurities increase the hardness up to 3 or 4. The color varies from pure white and silvery white through gray, green, apple green, to dark green, also yellow, brown, and reddish when impure. It is commonly compact or massive, or in fine granular aggregates, and often in foliated plates or in fibrous aggregates.

Uses.

Although the uses of talc and soapstone are many and varied, some of them are not in general well known nor fully developed; and although few of their uses can justly be considered essential in the sense that no substitute can be used, there are several which are of great importance. The widest use of talc is in the powdered form, and the value depends upon color (whiteness), uniformity, fineness of grain, freedom from grit, 'slip,' and sometimes freedom from lime. The white varieties, free from grit and iron, low in lime, ground to 200-mesh and finer, are largely used as a filler for paper, rubber and paint, and the very highest grade as toilet powder. Ground talc is also used in dressing and coating cloth, in making soap, rope, twine, pipe-covering compounds, heavy lubricants, and polishes, and as a filler in concrete to make it waterproof. Ground talc and soapstone are used in ceramic body for tile and china; for foundry facings, either alone or mixed with graphite and a coarser grade is used in the manufacture of asphalt-coated roofing felts and papers, both as a filler and as a surfacing. Massive close-grained talc, free from iron and grit, is cut into blanks and baked, forming the material used for gas tips and electrical insulation, commonly known as 'lava.' Its hardness, its resistance to heat, acids and alkalies, and its great dielectric strength make it very useful for electric insulation, and no satisfactory substitute for it has been found.

Massive varieties of talc, pyrophyllite, and high grades of soapstone are cut into slate pencils and steel-workers' crayons. 'French chalk' or 'tailor's chalk' is a soft, massive talc. In China, Japan and India, massive talc (steatite) is carved into images and other forms, and is often sold as imitation jade. Soapstone is cut into slabs of 1 and 2 inches in thickness and sold as griddles, footwarmers, and fireless-cooker stones, or fabricated into laundry sinks and tubs, laboratory table tops, hoods, tanks and sinks, electric switchboards, and for other uses in which the properties of resistance to heat, acids and alkalies, and electricity are essential.

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Talc Production of California, by Years.

Production was intermittent in the State up to 1912; but there has been a material growth since 1916, as shown in the following table:

Year	Tons	Value	Year	Tons	Value
1893	400	$17,750	1917	5,267	$45,279
1894			1918	11,760	85,534
1895	25	375	1919	8,764	115,091
1896			1920	11,327	221,362
1897			1921	8,752	130,078
1898			1922	13,378	197,186
1899			1923	17,439	252,661
1900			1924	16,179	242,770
1901	10	119	1925	15,465	239,084
1902	14	288	1926	17,004	255,645
1903	219	10,124	1927	16,218	164,744
1904	228	2,315	1928	18,668	251,372
1905	300	3,000	1929	18,676	193,493
1906			1930	15,861	154,258
1907			1931	13,472	109,940
1908	3	48	1932	10,690	122,880
1909	33	280	1933	14,451	153,668
1910	740	7,260	1934	13,920	158,606
1911			1935	17,332	170,830
1912	1,750	7,350	1936	25,643	309,287
1913	1,350	6,150	1937	29,657	347,772
1914	1,000	4,500	1938	28,346	290,810
1915	1,663	14,750	1939	31,820	372,078
1916	1,703	9,831	Totals	389,527	$4,767,568

STRONTIUM

Bibliography: State Mineralogist Report XXVI, XXVII, XXXV, Bulletins 67, 91. U. S. G. S. Bull. 540; 660-I.

There was a small shipment of strontianite in California during 1939 from the deposit near Barstow, San Bernardino County and this was used in a new steel alloy. The annual figures are concealed under the 'Unapportioned' item so as not to reveal the output of an individual. The last previous production was in 1918, though in that year both celestite ($SrSO_4$), and the carbonate, strontianite ($SrCO_3$) were shipped. The first recorded commercial output of strontium minerals in California was in 1916. The occurrence of the carbonate is particularly interesting and valuable, as it appears to be the only considerable deposit of commercial importance so far opened up in the United States. Shipments reported as averaging 80% $SrCO_3$ have been made. The deposit is associated with deposits of barite near Barstow, San Bernardino County. The carbonate has also been found in massive form near Shoshone, Inyo County. In addition to Imperial County, celestite is found near Calico and Ludlow, and in the Avawatz Mountains in San Bernardino County, but as yet undeveloped.

The principal use for strontium in the United States is in the form of the nitrate in the manufacture of red flares, or Costen and Bengal lights and fireworks.

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Production of strontium minerals in California, by years, has been as follows:

Year	Tons	Value	Year	Tons	Value
1916	57	$2,850	1919		
1917	3,050	37,000	1939	*	*
1918	2,900	33,000	Totals	6,007	$72,850

* Annual details concealed under 'Unapportioned.'

SULPHUR

Bibliography: State Mineralogist Reports IV, XIII, XIV, XXV, XXXIV, XXXV. Bulletins 38, 67, 91.

During 1939 sulphur was produced in California from three properties in Inyo County to the total of 4,811 short tons valued at $73,741, this being an increase in amount and value as compared with 1938 output. Also development work is being done at the Leviathan Mine in Alpine County. This mineral has been found to some extent in Alpine, Colusa, Imperial, Inyo, Kern, Lake, Sonoma, Tehama, and Ventura counties.

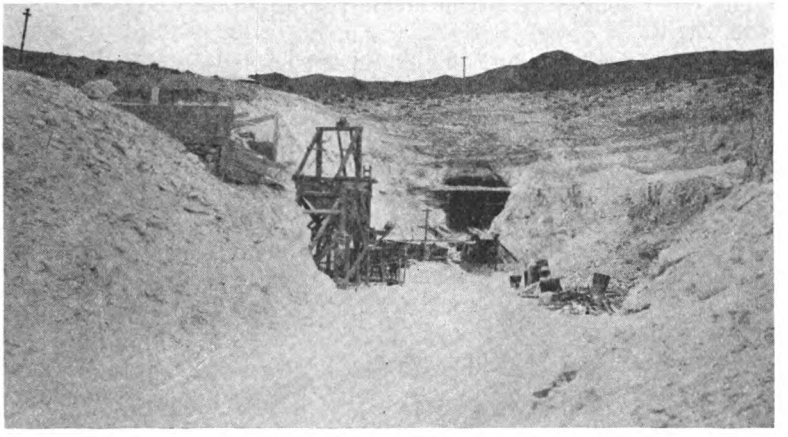

Photo by W. B. Tucker

Open cut and portal—Crater Sulphur Mine, Last Chance Range, Inyo County

Total Production of Sulphur in California.

Sulphur was produced at the famous Sulphur Bank mine in Lake County, during the years 1865-1868 (inc.); following which the property became more valuable for its quicksilver. The Elgin quicksilver mine, near Wilbur Springs, Colusa County, is a similar occurrence.

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Production of sulphur in California to date:

Year	Tons	Value	Year	Tons	Value
1865 1866 1867*	941	$53,500	1932 1933*	1,991	$32,838
1868 to 1922			1934	4,412	67,656
1923 1924*	185	4,071	1935 1936*	5,308	61,603
1925 to 1928			1937 1938*	9,451	120,010
1929 1930 1931*	265	9,025	1939	4,811	73,741
			Totals	27,364	$422,444

* Annual details concealed under 'Unapportioned.'

ZIRCON

Bibliography: State Mineralogist Report XXXIV.

During 1939 there were no shipments of zircon sands in California. In 1937 for the first time, zircon was reported in commercial quantities in this State. The Kaufield gold dredge near Lincoln placer recovered considerable zircon from their black sands some of which was shipped for experimental purposes in the manufacture of refractories and for an abrasive in sand blast.

The chief source of zirconium is the mineral zircon, a zirconium silicate, $ZrSiO_4$. Zircon is used, as a gem, being next to the diamond in brilliancy; as a refractory, molds for steel, insulation in electric heating devices, as a coating on other refractories, coating of welding rods, and in the manufacture of other zirconium compounds.

The metal zirconium is used in radio tubes as an alloy in steel, with copper, etc.

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CHAPTER SIX

SALINES

Bibliography: State Mineralogist Reports III, XIV, XV, XVII-XXIX (inc.), XXXIII-XXXV (inc.). Bulletin 24. Spurr and Wormser, "Marketing of Minerals." "Non-Metallic Minerals," by R. B. Ladoo. "Industrial Minerals and Rocks," A. I. M. E., 1937. See also under each substance.

Under this heading are included borax, common salt, soda, potash, and other alkaline salts. The first two have been produced in a number of localities in California, more or less regularly since the early sixties. Except for a single year's absence, soda has had a continuous production since 1894. Potash, magnesium chloride and sulphate, and calcium chloride have been added to the commercial list in recent years, joined in 1926 by bromide, and in 1931 by iodine and in 1938 by the alum minerals. The nitrates are still prospective.

Our main resources of salines are the lake beds of the desert regions of Imperial, Inyo, Kern, Los Angeles, San Bernardino, and San Luis Obispo counties, and the waters of the Pacific Ocean.

The total value of this group showed a decrease from $14,279,949 in 1938 to $13,178,499 in 1939.

The following table gives details for each year:

Substance	1938		1939		Increase+ Decrease— Value
	Amount	Value	Amount	Value	
Borates	276,144 tons	$5,014,237	244,819 tons	$5,110,807	$96,570+
Magnesium salts	24,167 tons	469,636	3,895 tons	382,457	87,179—
Salt	395,746 tons	1,099,737	417,956 tons	1,174,386	74,649+
Soda	178,105 tons	2,023,610	200,049 tons	2,055,608	31,998+
Unapportioned		[b]5,672,729		[a]4,455,241	1,217,488—
Total values		$14,279,949		$13,178,499	
Net decrease					$1,101,450—

[a] Includes bromine, calcium chloride, iodine and potash.
[b] Includes alunogen, bromine, calcium chloride, iodine, and potash.

ALUM MINERALS

Bibliography: State Mineralogist Report XXXV.

There are several minerals found in California that are considered natural alums. They are hydrous aluminum sulphates combined with sulphates of iron, potassium, sodium or magnesium. The most important are: Alunite, $K_2Al_6(OH)_{12}(SO_4)_4$, a basic hydrous aluminum and potassium sulphate, and Alunogen, $Al_2(SO_4)_3.16H_2O$, an hydrous aluminum sulphate.

In 1938 a small production and some development work was done on an alunogen deposit near Corona, Riverside County. During 1939 this property changed hands and not till February of 1940 did it get into production and the material is being sold as a soil conditioner.

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The 1938 output was the first recorded commercial production reported in California. The annual details are combined under 'Unapportioned' item to conceal the output of the single operator. An alunite deposit near Glen Ellen, Sonoma County, was opened up several years ago and some development work has been done in hopes of commercializing this mineral.

BORATES

Bibliography: State Mineralogist Reports III, X, XII-XV (inc.), XVII-XXIX (inc.), XXV-XXVII (inc.), XXXIII-XXXIV. Bulletins 24, 67, 91.

During 1939 there was produced in California a total of 238,390 tons of borate materials compared with 240,899 tons for the year 1938. The material shipped during the year included the new sodium borates, kernite (rasorite), kramerite from Kern County; also crystallized borax prepared by evaporation of brines at Searles Lake in San Bernardino County and Owens Lake in Inyo County.

As the crude ore is not sold as such, but is almost entirely refined into borax of commerce before shipping, and because of the fact that the material varied widely in boric acid content, we have recalculated the tonnage to a basis of 40 per cent A.B.A. This is approximately the average A.B.A. content of colemanite material after calcining, and also of the crystallized borax obtained from evaporation of the lake brines.

Recalculated as above, the 1939 production totaled 244,819 tons valued at $5,110,807. This was a decrease in quantity and a slight increase in value from the 1938 output, which was 276,144 tons worth $5,014,237.

The total amount of borates exported from the United States[1] during the year 1939 was 91,139 tons valued at $3,230,304, as compared with 77,519 tons valued at $2,642,446 in 1938.

Total Production of Borate Materials in California.

Borax was first discovered in California in the waters of Tuscan Springs in Tehama County, January 8, 1856. Borax Lake in Lake County was discovered in September of the same year by Dr. John A. Veach. This deposit was worked in 1864-1868, inclusive, and during that time produced 1,181,365 pounds of refined borax. The bulk of it was exported by sea to New York. This was the first commercial output of this salt in the United States, and California is still today the leading American producer of borax, having been for many years the sole producer. California is also the premier world source, today.

Production from the dry lake 'playa' deposits of Inyo and San Bernardino counties began in 1873; but it was not until 1887 that the borax industry was revolutionized by the discovery of the colemanite beds at Calico, in San Bernardino County and later similar beds in Inyo and Los Angeles counties. The colemanite deposits of Ventura County were not worked extensively, owing to lack of transportation facilities. Some production of colemanite has been made from deposits opened up in Clarke County, Nevada. Colemanite was in turn, displaced by the discovery in 1926 of kernite (rasorite) a sodium borate

[1] Monthly Summary of Foreign Commerce of the United States, Department of Commerce, Dec., 1939, Part 1.

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and probertite (kramerite) a hydrous sodium, and calcium borate, near Kramer in Kern County. The brines of Searles Lake are likewise an important source.

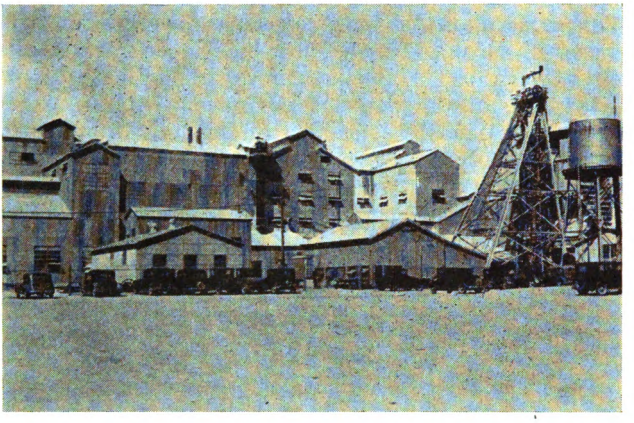

Photo by W. B. Tucker

Pacific Coast Borax Co. mine at Kramer, Kern County

The total production of borate materials in California is shown in the following table:

Total Production of Borate Materials in California

Year	Tons	Value	Year	Tons	Value
1864	12	$9,478	1903	34,430	$661,400
1865	126	94,099	1904	45,647	698,810
1866	201	132,538	1905	46,334	1,019,158
1867	220	156,137	1906	58,173	1,182,410
1868	32	22,384	1907	53,413	1,200,913
1869			1908	22,200	1,117,000
1870			1909	16,628	1,163,960
1871			1910	16,828	1,177,960
1872	140	89,600	1911	50,945	1,456,672
1873	515	255,440	1912	42,135	1,122,713
1874	915	259,427	1913	58,051	1,491,530
1875	1,168	289,080	1914	62,500	1,483,500
1876	1,437	312,537	1915	67,004	1,663,521
1877	993	193,705	1916	103,523	2,409,375
1878	373	66,257	1917	109,944	2,561,958
1879	364	65,443	1918	88,772	1,867,908
1880	609	149,245	1919	66,791	1,717,192
1881	690	189,750	1920	127,065	2,794,206
1882	732	201,300	1921	50,136	1,096,326
1883	900	265,500	1922	[2]39,087	1,068,025
1884	1,019	198,705	1923	62,667	1,893,798
1885	942	155,430	1924	52,070	1,599,149
1886	1,285	173,475	1925	46,124	1,526,938
1887	1,015	116,689	1926	47,605	1,625,298
1888	1,405	196,636	1927	72,462	3,043,260
1889	965	145,473	1928	109,722	3,378,552
1890	3,201	480,152	1929	144,678	3,312,085
1891	4,267	640,000	1930	209,869	3,686,817
1892	5,525	838,787	1931	206,405	5,753,037
1893	3,955	593,292	1932	179,356	2,856,470
1894	5,770	807,807	1933	197,495	3,019,513
1895	5,959	595,900	1934	240,696	5,524,262
1896	6,754	675,400	1935	280,249	4,602,064
1897	8,000	1,080,000	1936	313,389	5,911,093
1898	8,300	1,153,000	1937	326,099	6,206,619
1899	20,357	1,139,882	1938	276,144	5,014,237
1900	25,837	1,013,251	1939	244,819	5,110,807
1901	22,221	982,380			
1902	[1]17,202	2,234,994	Totals	4,322,861	$108,991,709

[1] Refined borax. [2] Recalculated to 40% 'anhydrous boric acid' equivalent beginning with 1922.

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BROMINE

The first commercial production of bromine and bromine compounds was begun during 1926 by the California Chemical Corporation in its plant at Chula Vista, San Diego County, from salt-works bittern waters. This same plant has been recovering magnesium chloride for a number of years. Bromine is also now being made at a similar bittern-water plant at Newark, Alameda County. The 1939 output showed a decreased value and amount as compared with 1938 production; annual details of which are concealed under the 'Unapportioned' item so as not to reveal the production of the single company which operated both plants.

The total commercial production of bromine in California is as follows:

Year	Tons	Value	Year	Tons	Value
1926–1928*	158	$120,480	1932–1934*	559	$146,547
1929–1931*	802	552,933	1935–1936*	805	191,465	
			1937–1938*	914	327,823
			1939	*	*
			Totals	3,238	$1,339,248

*Annual details concealed under 'Unapportioned.'

CALCIUM CHLORIDE

Bibliography: U. S. Geol. Surv., Min. Res. 1919, Pt. II. Engineering and Contracting, Roads and Streets, monthly issue, Feb. 6, 1924. 'How to Maintain Roads,' manual of instruction of Dow Chemical Company.

Calcium chloride is hygroscopic, that is, it has an affinity for water. This property is taken advantage of by utilizing this salt as a drying agent. During 1939 the production of calcium chloride in California came from one plant in San Bernardino County. The annual details are combined under the 'Unapportioned' item to conceal the output of the operator. The 1939 output showed a decrease in both amount and value as compared with that of 1938.

Total Calcium Chloride Production in California.

Commercial production of calcium chloride in California was first reported to the State Mining Bureau in 1921, from two plants in San Bernardino County, being obtained as a by-product in the refining of salt from deposits in certain of the desert dry lakes. Total production in California is shown in the following tabulation:

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Year	Tons	Value	Year	Tons	Value
1921	683	$22,980	1930		
1922			1931 *	9,688	$103,237
1923 *	1,204	26,580	1932		
1924			1933 *	3,103	15,500
1925 *	10,988	328,876	1934		
1926			1935 *	4,048	16,196
1927 *	34,195	508,748	1936		
1928			1937 *	7,227	35,073
1929 *	12,020	114,080	1938		
			1939 *	7,279	40,182
			Totals	90,435	$1,211,452

* Annual details concealed under 'Unapportioned.'

IODINE

Bibliography: State Mineralogist Report XXXIV. U. S. Bureau of Mines I. C. 6387.

In 1939 the output of iodine in California came from two plants in Los Angeles County and showed an increase in both quantity and value over 1938. The annual details for 1939 are concealed under the "Unapportioned" item to conceal the output of either operator. The combined 1937-1938 production came from three plants in Los Angeles County, and amounted to 624,318 pounds, valued at $508,119.

Total Iodine Production in California.

Iodine was first produced in California during 1917 to 1921 as a by-product of potash which was reduced from kelp in an experimental station of U. S. Department of Agriculture at Summerland, but after the armistice the demand for these minerals decreased so that the plant in Santa Barbara County closed. In 1929 the General Salt Company erected a plant which reduces iodine from the waste waters of certain deep oil wells in the Long Beach field. During 1933 two more plants started operation, making a total of three producing plants in the State.

Year	Pounds	Value
1929		
1931 *	696,297	$1,374,311
1933		
1934	355,279	423,016
1935		
1936 *	487,401	379,702
1937		
1938 *	624,318	508,119
1939	*	*
Totals	2,163,295	$2,685,148

* Annual details concealed under 'Unapportioned.'

MAGNESIUM SALTS

Bibliography: State Mineralogist Reports XX, XXI, XXV-XXVI (inc.), XXXIV. Bulletin 91. 'Dictionary of Applied Chemistry,' by Thorpe. U. S. Geol. Surv., Min. Res. of P. S.

During 1939 there was an output of magnesium salts in California coming from one plant in San Diego County, and two in San Mateo

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County. This amounted to 3,895 short tons valued at $382,457, and consisted of the chloride, carbonate, hydroxide, and oxide. The 1938 output amounted to 24,176 tons worth $469,636, which was also the chloride, carbonate, hydroxide, and oxide. The chloride was nearly all sold for use in magnesite stucco and cement mixtures (Sorel cement), also some for road liquor. The carbonate, or bulky white powder, was used as a heat-insulating material, as a substitute for magnesite, as a filler for rubber, paper, paint, etc., and in medicines, in tooth paste, in face powder and as a polish for metal and glass. The sulphate market in past years was utilized for medicinal and bath purposes. The material coming from San Diego County was residual bitterns from the salt plants and was in part marketed in the liquid form carrying from 35% to 67% $MgCl_2$ and in part as dry crystals, while that from Alameda and San Mateo counties was magnesium carbonate, magnesium hydroxide, and magnesium oxide, obtained by precipitation from sea water.

The average value reported for the chloride produced in California in 1939 was approximately $29.80 per ton, f.o.b. plant, and in 1938 approximately $28.30 per ton, f.o.b. plant.

Total Production of Magnesium Salts in California.

Commercial production of magnesium chloride in California was begun in 1916 by some of the salt companies, from the residual bitterns obtained during the evaporation of sea water for its sodium chloride. In addition, some magnesium sulphate, or 'epsom salts' has also been made, but in smaller amount, and magnesium carbonate by a patented process, direct from sea water.

The total production of magnesium salts in California, since the beginning of the industry here, is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1916	851	$6,407	1929		
1917	1,064	34,973	1930 *	4,914	$333,906
1918	1,008	29,955	1931		
1919	1,616	82,457	1932 *	2,749	217,979
1920	3,150	107,787	1933	2,073	159,660
1921	4,153	106,140	1934	2,325	194,642
1922	3,036	89,788	1935	2,785	235,531
1923	3,662	116,031	1936	3,798	347,838
1924	4,823	145,883	1937	3,867	316,669
1925	4,221	132,553	1938	24,176	469,636
1926	4,881	124,470	1939	3,895	382,457
1927					
1928 *	6,241	139,589	Totals	89,288	$3,774,351

* Annual details concealed under 'Unapportioned.'

NITRATES

Bibliography: State Mineralogist Reports XV, XXV, XXVI, XXVII, XXXIV. Bulletins 24, 67, 91. U. S. G. S., Press Bulletin No. 373, July, 1918. Smithsonian Inst., Publ. No. 2421, 1916.

Nitrates of sodium, potassium and calcium have been found in various places in the desert regions of the State, but no deposit of commercial value has been developed as yet. It is hoped that a closer search may some day be rewarded by workable discoveries. At present

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the principal commercial source of nitrates is the Chilean saltpeter (sodium nitrate) deposits in South America.

The fixation of atmospheric nitrogen electrically has been accomplished successfully in Germany and Scandinavia. The possibilities of cheap hydroelectric power in California make the subject one of interest to us, as we have also the natural raw materials and chemicals to go with the explosives. Sodium and potassium cyanides can be made by fixation of atmospheric nitrogen electrically.

POTASH

Bibliography: State Mineralogist Reports XV, XVIII, XX, XXII, XXV-XXVII (inc.), XXXIV. Bulletins 24, 67, 91. U. S. G. S., Min. Res. 1913, 1914, 1915. Senate Doc. No. 190, 62 Congress, 2d Session. Mining & Sci. Press, Vol. 112, p. 155; Vol. 114, p. 789. Eng. & Min. Jour.-Press, Vol. 117, p. 557, Apr. 5, 1924.

The 1939 production of potash in California came from a single operator in San Bernardino County, the details of which are concealed under the 'Unapportioned' item. This was principally chloride and the product averaged 60% equivalent K_2O content. The material was sold mainly for fertilizer manufacture.

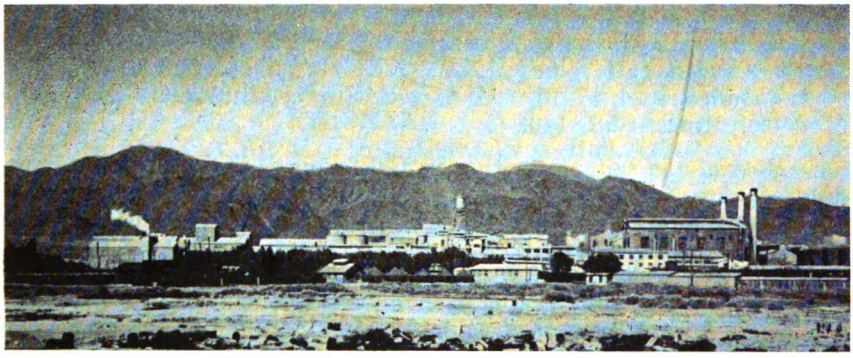

Photo by Walter W. Bradley

Plant of American Potash and Chemical Co., at Trona on Searles Lake, San Bernardino County

Imports of crude potash minerals and salts in the United States during 1939 according to the U. S. Bureau of Foreign and Domestic Commerce amounted to 210,818 long tons, valued at $5,752,225, compared with 379,486 long tons worth $9,856,201 in 1938. These materials consisted mainly of 'manure salts,' crude chloride (muriate) and sulphate, and kainite, all of which are admitted duty free.

Quotations have recently ranged from $36.25 per ton c.i.f. Atlantic and Gulf ports for high grade sulphate (90%-95%), and $16.50 for manure salts (30%).

Total Production of Potash in California.

Potash production began commercially in California in 1914, with a small yield from kelp. Practically all of the output now comes from

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deposits of potash-bearing residues and brines in the old lake beds of the desert regions, particularly Searles Lake, San Bernardino County. A small amount has been made from salt-works bitterns, and for a time there was some from Portland cement dust. Some also has been obtained from molasses distillery-slops char.

The annual amounts and values of these potash materials, since their beginning in California in 1914, have been as follows:

Year	Tons	Value	Year	Tons	Value
1914	10	$460	1927	67,340	$1,952,852
1915	1,076	19,391	1928	178,680	5,522,350
1916	17,808	663,605	1929		
1917	129,022	4,202,889	1930	172,263	5,500,536
1918	49,381	6,808,976	1931		
1919	28,118	2,415,963	1932	153,147	3,932,721
1920	26,298	1,465,463	1933		
1921	14,806	390,210	1934	355,604	3,750,809
1922	17,776	584,388	1935		
1923	29,597	709,836	1936	358,417	6,988,922
1924	33,107	747,407	1937		
1925	36,355	829,770	1938	383,981	9,057,866
1926	32,884	812,285	1939		
			Totals	1,985,770	$55,361,699

* Annual details concealed under 'Unapportioned.'

SALT

Bibliography: State Mineralogist Reports II, XII-XV (inc.), XVII-XXIII (inc.), XXV-XXVII (inc.), XXXIV-XXXV. Bulletins 24, 67, 91. U. S. Geol. Survey, Bull. 669. U. S. Bur. of Mines, Bull. 146.

Most of the salt production in California is obtained by evaporation of water of the Pacific Ocean, plants being located on the shores of San Francisco, Monterey, and San Diego bays, and at Long Beach. Additional amounts are derived from lakes and lake beds in the desert regions (in part, rock salt), mainly in Imperial, Kern, and San Bernardino counties, and evaporation of alkaline lake water in Modoc County. A small amount of valuable medicinal salts has been obtained by evaporation of the water of Lake Mono, Mono County, and from a mineral spring in Butte County.

During 1939 there was an output in California of 417,956 tons of salt worth $1,174,386, compared with 395,746 tons worth $1,099,737 in 1938. There were sixteen operating plants in 1939; three in Alameda County; two each in Imperial and San Bernardino counties; and one each in Butte, Kern, Los Angeles, Mono, Modoc, Monterey, Orange, San Diego, and San Mateo counties.

The average value reported for salt produced in California during 1939 was $2.75 per ton f.o.b. plant, compared with $2.78 in 1938, $2.82 in 1937, $3.08 in 1936, $3.36 in 1935, and $3.68 in 1934.

Production of Salt in California, by Years.

Although salt has been made in California since the early '60's, there are no definite or authenticated records for the earlier years before the beginning of the statistical tabulations by the State Mining Bureau.

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Amount and value of annual production of salt in California from 1887 is shown in the following tabulation:

Year	Tons	Value	Year	Tons	Value
1887	28,000	$112,000	1914	223,806	$583,553
1888	30,800	92,400	1915	169,028	368,737
1889	21,000	63,000	1916	186,148	455,695
1890	8,729	57,085	1917	227,825	584,373
1891	20,094	90,303	1918	212,076	806,328
1892	23,570	104,788	1919	233,994	896,963
1893	50,500	213,000	1920	230,638	972,648
1894	49,131	140,087	1921	197,989	832,702
1895	53,031	150,576	1922	223,238	819,187
1896	64,743	153,244	1923	275,979	1,130,670
1897	67,851	157,520	1924	318,800	1,159,137
1898	93,421	170,855	1925	284,068	949,826
1899	82,654	149,588	1926	311,761	1,124,978
1900	89,338	204,754	1927	263,028	639,127
1901	126,218	366,376	1928	340,580	1,024,656
1902	115,208	205,876	1929	392,039	2,665,436
1903	102,895	211,365	1930	347,945	1,167,487
1904	95,968	187,300	1931	330,951	1,233,567
1905	77,118	141,925	1932	256,353	918,480
1906	101,650	213,228	1933	321,312	1,251,024
1907	88,063	310,967	1934	332,194	1,222,810
1908	121,764	281,469	1935	365,711	1,230,480
1909	155,680	414,708	1936	398,249	1,227,505
1910	174,920	395,417	1937	370,431	1,044,325
1911	173,332	324,255	1938	395,746	1,099,737
1912	185,721	383,370	1939	417,956	1,174,386
1913	204,407	462,681			
			Totals	10,032,651	$32,341,954

SODA

Bibliography: State Mineralogist Reports XII, XIII, XV, XVII, XVIII, XX, XXII, XXIII, XXV-XXIX (inc.), XXXIV. Bulletins 24, 67, 91. U. S. Geol. Surv., Bull. 717.

The production of sodium salts in California in 1939 included soda ash, and trona, from plants at Owens Lake, Inyo County; and soda ash, salt cake, and trona (sequi-carbonate, a double salt of Na_2CO_3 and $NaHCO_3$) from Searles Lake, San Bernardino County. There were no shipments of salt cake (sulphate) from Carrizo Plains, San Luis Obispo County.

The output for 1939 amounted to 200,049 tons valued at $2,055,608, as compared with 178,105 tons valued at $2,023,610 in 1938.

The soda ash was used mainly in the manufacture of soap, glass, paper, oil refining, sugar refining, and chemicals; and the trona for metallurgical purposes.

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Soda Production of California, by Years.

The total output, showing amount and value of these materials in California since the inception of the statistical records of the State Mining Bureau, is given in the table which follows:

Year	Tons	Value	Year	Tons	Value
1894	1,530	$20,000	1918	20,447	$855,423
1895	1,900	47,500	1919	21,294	721,958
1896	3,000	65,000	1920	32,407	1,164,898
1897	5,000	110,000	1921	14,828	438,996
1898	7,000	154,000	1922	20,084	573,661
1899	10,000	250,000	1923	34,885	764,284
1900	1,000	50,000	1924	32,536	711,796
1901	8,000	400,000	1925	48,625	947,649
1902	7,000	50,000	1926	63,333	1,305,802
1903	18,000	27,000	1927	62,571	1,478,239
1904	12,000	18,000	1928	80,838	1,469,297
1905	15,000	22,500	1929	90,646	1,838,657
1906	12,000	18,000	1930	90,122	1,627,344
1907	----------	----------	1931	78,701	1,217,811
1908	9,600	14,400	1932	58,017	826,369
1909	7,712	11,593	1933	70,598	1,019,130
1910	8,125	11,862	1934	99,380	1,219,561
1911	9,023	52,887	1935	125,504	1,341,045
1912	7,200	37,094	1936	144,314	1,412,788
1913	1,861	24,936	1937	153,685	1,461,057
1914	6,522	115,396	1938	178,105	2,023,610
1915	5,799	83,485	1939	200,049	2,055,608
1916	10,593	264,825			
1917	24,505	928,578	Totals	2,013,339	$29,252,039

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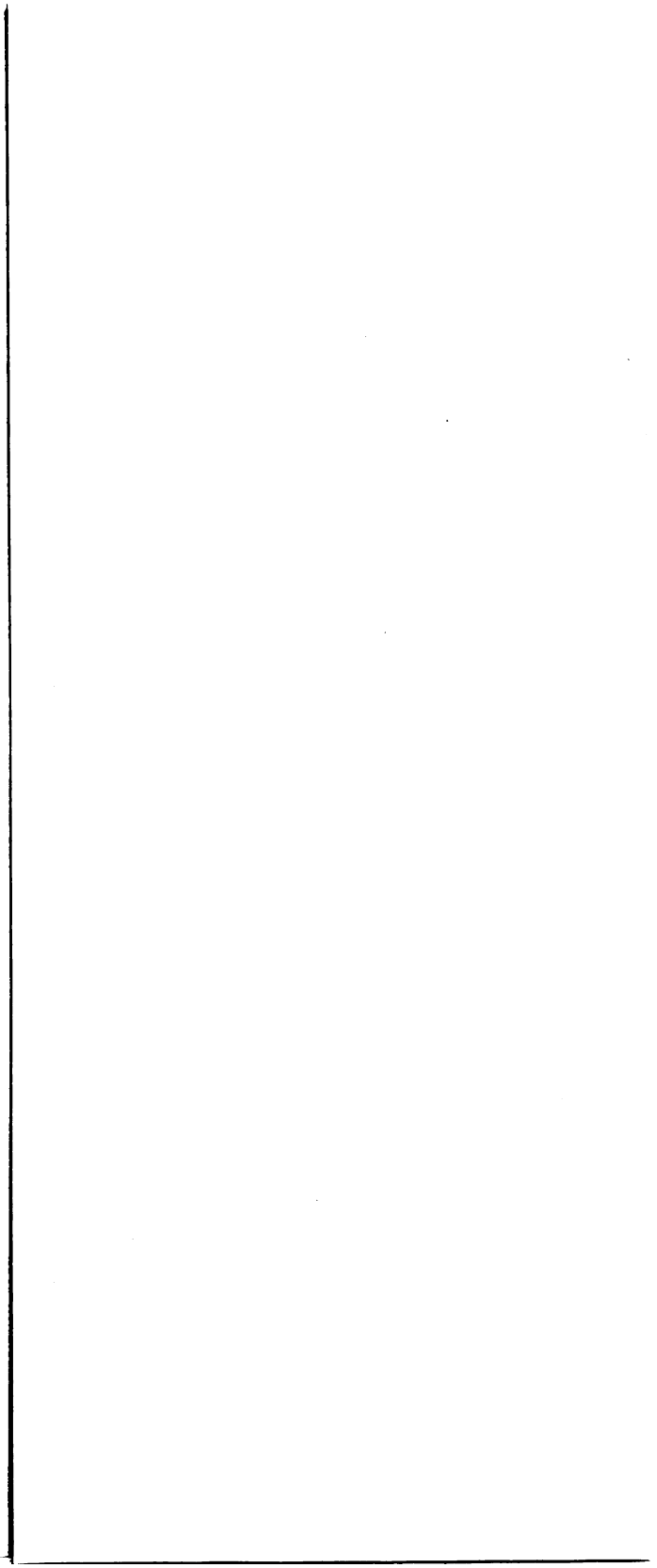

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CHAPTER SEVEN

BY COUNTIES

Introductory.

The State of California includes a total area of 158,297 square miles, of which 155,652 square miles are of land. The maximum width is 235 miles, the minimum 148 miles, and the length from the northwest corner to the southeast corner is 775 miles. The State is divided into fifty-eight counties. The 1930 census figures show a total population for California of 5,672,009. Minerals of commercial value exist in every county, and during 1936 some active production was reported to the State Division of Mines from all of the fifty-eight.

Rank of Counties in Mineral Yield, 1938.

Of the ten leading counties in point of total value of mineral output for 1939, the first six, viz., Los Angeles, Kern, Fresno, Ventura, Orange, Kings, and Santa Barbara ninth, owe their position to petroleum and natural gas. Los Angeles County, due to crude oil, led all other counties in 1939 and is credited with 32% of the State's total mineral value, holding this position since 1923 when it passed Kern, which previously led the State for many years. San Bernardino (seventh) owes its position to cement, borates, and potash. Nevada (eighth) owes its position to gold; and Sacramento (tenth) to gold.

There were thirty counties having a mineral production valued in excess of a million dollars in 1939, in seven of which petroleum and natural gas each were an important item; in seventeen, gold; in six, cement; in two, borates and miscellaneous stone; and in one each, potash and soda, diatomite.

In point of variety and diversity San Bernardino County led all others in 1939 with twenty-seven different mineral substances on its commercial list, followed by Los Angeles and Inyo counties each with twenty-two different substances; Kern County with twenty; Fresno County with sixteen; Orange, Riverside, San Diego, and Tuolumne counties each with fourteen; El Dorado, Imperial, each with thirteen; Monterey County with twelve; Butte, Placer, and San Luis Obispo counties each with eleven; and Calaveras, Contra Costa, Napa, and Sacramento counties each with ten.

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	County	Value		County	Value
1	Los Angeles	$113,577,646	31	Sierra	$871,212
2	Kern	62,105,687	32	Imperial	822,271
3	Fresno	21,275,300	33	Santa Clara	716,346
4	Ventura	20,773,214	34	Napa	714,895
5	Orange	18,850,782	35	Tuolumne	669,844
6	Kings	16,647,443	36	Solano	640,024
7	San Bernardino	14,664,598	37	San Diego	633,147
8	Nevada	11,468,556	38	San Benito	547,093
9	Santa Barbara	8,911,006	39	Mono	513,357
10	Sacramento	5,875,597	40	Tulare	452,547
11	Calaveras	5,392,940	41	Lake	451,575
12	Amador	4,314,573	42	Sonoma	329,069
13	El Dorado	3,277,679	43	Monterey	229,058
14	Yuba	3,192,056	44	San Luis Obispo	174,124
15	Riverside	3,187,902	45	Marin	133,756
16	Santa Cruz	3,140,742	46	Humboldt	133,150
17	Alameda	2,778,587	47	Madera	119,831
18	Merced	2,611,896	48	Tehama	82,094
19	San Mateo	2,418,895	49	Sutter	68,733
20	Plumas	2,265,956	50	Yolo	63,143
21	Butte	2,217,721	51	Glenn	54,591
22	Contra Costa	2,206,131	52	San Francisco	52,669
23	Shasta	2,058,547	53	Mendocino	47,691
24	Siskiyou	1,847,687	54	Lassen	46,277
25	Mariposa	1,755,776	55	Modoc	23,658
26	Placer	1,710,738	56	Colusa	20,149
27	Inyo	1,614,597	57	Del Norte	13,101
28	Trinity	1,514,951	58	Alpine	7,328
29	San Joaquin	1,104,898			
30	Stanislaus	1,069,730		Total value	$352,462,564

ALAMEDA

Land area: 732 square miles.
Population: 475,153 (1930 census).
Location: East side of San Francisco Bay.
County seat: Oakland.
References: State Mineralogist Report XVII : XVIII : XX : XXVI (Oct., 1929); XXXV.

Alameda, while in no sense one of the 'mining counties' came seventeenth on the list of counties as to value, with a mineral production for 1939 worth $2,778,587, and had seven different substances. This was an increase over the 1938 output which was valued at $2,531,600.

Commercial production for 1939 was as follows:

Substance	Amount	Value
Clay (pottery)	10,434 tons	$17,073
Stone, miscellaneous		1,325,914
Unapportioned *		1,435,600
Total value		$2,778,587

* Includes brick and hollow building tile, bromine, lime, and salt.

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ALPINE

Land area: 776 square miles.
Population: 236 (1930 census).
Location: On eastern border of State, south of Lake Tahoe.
County seat: Markleeville.
References: State Mineralogist Report XV : XVII : XVIII : XXVII (Oct., 1931) : XXV.

Alpine County ranked fifty-eighth in value of output for 1939, which was $7,328, compared with $11,123 in 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	--------	$1,715
Silver	4,489 fine ozs.	3,047
Unapportioned *	--------	2,566
Total value		$7,328

* Includes copper, lead, and miscellaneous stone.

AMADOR

Land area: 601 square miles.
Population: 8494 (1930 census).
Location: East-central part of State—Mother Lode District.
County seat: Jackson.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XX : XXII : (April, 1927) : XXX, XXXV.

Amador County ranked twelfth as to value of mineral output for 1939, with nine different substances worth $4,314,573 compared with $3,880,440 in 1938.

Amador at one time led the State in gold production, though exceeded in 1920-1923 and in 1926-1927 by Yuba and Nevada counties; but in 1925 and 1928 by Yuba only, in 1929-1930 by Nevada only, and in 1931-1936 and 1938 by Nevada and Sacramento.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Clay, pottery	37,780 tons	$64,147
Copper	3,933 lbs.	409
Gold	--------	4,167,030
Silver	22,703 fine ozs.	15,411
Stone, miscellaneous	--------	3,300
Unapportioned *	--------	64,276
Total value		$4,314,573

* Includes brick, lead, platinum, volcanic ash.

BUTTE

Land area: 1722 square miles.
Population: 34,010 (1930 census).
Location: North-central portion of State.
County seat: Oroville.
References: State Mineralogist Report XV : XVII : XVIII : XXIV : XXVI (Oct., 1930) : XXXI (Jan., 1936).

Butte County ranked twenty-first in regard to value of mineral output in 1939 and eighth in respect to gold, with eleven different

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substances, having a total value of $2,217,721 compared with $2,177,265 in 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Copper	5,838 lbs.	$607
Gold	-------	2,079,385
Lead	11,799 lbs.	555
Silver	17,106 fine ozs.	11,611
Stone, miscellaneous	-------	123,517
Unapportioned *	-------	2,046
Total value		$2,217,721

* Includes natural gas, platinum, salt (medical), soapstone, mineral water.

CALAVERAS

Land area: 1027 square miles.
Population: 6009 (1930 census).
Location: East-central portion of State—Mother Lode District.
County seat: San Andreas.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXI : XXXII (July, 1936) : XXXV.

Calaveras County ranked eleventh in California in regard to value of mineral output in 1939, fourth in respect to gold, with a total of $5,392,940, as compared with $4,357,938 in 1938.

Commercial production for 1939 consisting of ten different substances, was as follows:

Substance	*Amount*	*Value*
Gold	-----	$3,709,895
Silver	23,664 fine ozs.	16,063
Stone, miscellaneous	-----	9,955
Unapportioned *	-----	1,657,027
Total value		$5,392,940

* Includes cement, clay (pottery), copper, lead, mineral water, platinum, slate.

COLUSA

Land area: 1140 square miles.
Population: 10,257 (1930 census).
Location: Sacramento Valley.
County seat: Colusa.
References: State Mineralogist Report XIV : XVII : XVIII : XXV : (April, 1929) : XXXV.

Colusa County ranked fifty-sixth in regard to the value of mineral output in 1939, with three different mineral substances, worth a total of $20,149, as compared with $2,884 in 1938.

Commercial production for 1939 was as follows:

Substance	*Value*
Gold	$35
Stone, miscellaneous	19,714
Other minerals	400
Total value	$20,149

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CONTRA COSTA

Land area: 714 square miles.
Population: 78,554 (1930 census).
Location: East side of San Francisco Bay.
County seat: Martinez.
References: State Mineralogist Report XVII : XVIII : XXIII (Jan., 1927) : XXXV.

Contra Costa County stands twenty-second on the list in respect to value of mineral output for 1939, with ten different substances worth $2,206,131, as compared with $2,116,285 in 1938.

Commercial production for 1939 was as follows:

Substance	*Value*
Brick and hollow building tile	$695,508
Stone, miscellaneous	320,320
Unapportioned *	1,190,303
Total value	$2,206,131

* Includes cement, clay (pottery), coal, gems, mineral water, quicksilver, silica (glass sand).

DEL NORTE

Land area: 1024 square miles.
Population: 4734 (1930 census).
Location: Extreme northwest corner of State.
County seat: Crescent City.
References: State Mineralogist Report XIV : XVII : XXI (July, 1925) : XXIX (Jan.-April, 1933) : XXXIV : XXXV.

Del Norte County was in fifty-seventh place as to mineral production for 1939 with five different substances worth $13,101 as compared with $15,296 in 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	--	$4,410
Silver	22 fine ozs.	15
Stone, miscellaneous	--	7,250
Unapportioned *	--	1,426
Total value		$13,101

* Includes chromite and platinum.

EL DORADO

Land area: 1753 square miles.
Population: 8303 (1930 census).
Location: East-central portion of the State, northernmost of the Mother Lode counties.
County seat: Placerville.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XX : XXII (Oct., 1926) : XXXI : XXXIV (July, 1938) : XXXV.

El Dorado, which contains the location where gold in California was first heralded into the world, comes thirteenth on the list of counties ranked according to value for 1939, with thirteen different mineral substances worth $3,277,679. In addition to the segregated figures

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here given, a large tonnage of limestone was formerly shipped for use in cement manufacture, the value being included in the State's total for cement. The 1938 output was valued at $2,207,099.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Copper	10,910 lbs.	$1,135
Gold	------	2,520,105
Lead	4,766 lbs.	224
Limestone	146,625 tons	320,212
Silver	12,710 fine ozs.	8,627
Stone, miscellaneous	------	16,422
Unapportioned *	------	410,954
Total value		$3,277,679

* Includes chromite, lime, platinum, slate, soapstone, mineral water.

FRESNO

Land area: 5950 square miles.
Population: 144,369 (1930 census).
Location: South-central portion of State.
County seat: Fresno.
References: State Mineralogist Report XIV : XVII : XVIII : XXV (July, 1929) : XXXV.

Fresno County, third in importance as a mineral producer among the counties of California, reports an output for 1939 of sixteen different mineral substances, with a total value of $21,275,300, as compared with the 1938 value of $30,159,518.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	----------	$16,100
Natural gas	54,485,085 M. cu. ft.	2,799,981
Petroleum	15,411,056 bbls.	18,077,169
Silver	85 fine ozs.	58
Stone, miscellaneous	----------	293,022
Unapportioned *	----------	88,970
Total value		$21,275,300

* Includes brick, clay (pottery), feldspar, gems, mineral water, gypsum, granite, limestone, quicksilver, tungsten.

GLENN

Land area: 1259 square miles.
Population: 10,935 (1930 census).
Location: West side of Sacramento Valley.
County seat: Willows.
References: State Mineralogist Report XIV : XVII : XVIII : XXXV.

Glenn County stands fifty-first as a mineral producing county of the State for 1939 and owes its position mainly to the presence of large deposits of sand and gravel, much of which is used as railroad ballast.

Commercial production for 1939 totaled $54,591, which is a decrease from $60,138, the 1938 total.

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HUMBOLDT

Land area: 3634 square miles.
Population: 43,189 (1930 census).
Location: Northwestern portion of State, bordering on Pacific Ocean.
County seat: Eureka.
References: State Mineralogist Report XIV : XVII : XVIII : XXI (July, 1925) : XXXV.

Humboldt County ranked forty-sixth in the value of its mineral output among the counties of the State for 1939, with seven different mineral substances valued at $133,150, compared with the 1938 output worth $97,181.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	---	$45,955
Silver	166 fine ozs.	113
Stone, miscellaneous	---	81,556
Unapportioned *	---	5,526
Total value		$133,150

* Includes brick, clay (pottery), natural gas, platinum.

IMPERIAL

Land area: 4089 square miles.
Population: 60,894 (1930 census).
Location: Extreme southeast corner of the State.
County seat: El Centro.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXII (April, 1926) : XXXIV : XXXV.

Imperial County ranked thirty-second in total value of mineral output for 1939, with thirteen different mineral substances, worth $822,271, compared with $604,227 for 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Copper	67,328 lbs.	$7,002
Gold	-----	687,995
Silver	8,951 fine ozs.	6,076
Stone, miscellaneous	-----	45,750
Unapportioned *	-----	75,440
Total value		$822,271

* Includes carbon dioxide, lead, gems (Iceland spar), gypsum, kyanite, limestone, manganese ore, salt.

INYO

Land area: 10,019 square miles.
Population: 6557 (1930 census).
Location: Lies on eastern border of State, north of San Bernardino County.
County seat: Independence.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXII (Oct., 1926) : XXVII: XXX : XXXIII : XXXIV (Oct., 1938) : XXXV.

Inyo County's mineral output for 1939 reached a total value of $1,614,597 having twenty-two different mineral substances and stand-

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ing twenty-seventh among the counties of the State as to value of production. The 1938 yield was worth $1,583,893.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Copper	74,543 lbs.	$7,752
Gold	------	443,275
Lead	174,407 lbs.	8,197
Pumice	5,886 tons	56,170
Silver	30,104 fine ozs.	20,434
Stone, miscellaneous	------	4,230
Sulphur	4,811 tons	73,741
Zinc	7,285 lbs.	379
Unapportioned *	------	1,000,419
Total value		$1,614,597

* Includes antimony, bentonite, borates, dolomite, garnets, iron ore, lime, limestone, marble, molybdenum, quicksilver, soda, talc, tungsten ore.

KERN

Land area: 8003 square miles.
Population: 82,219, (1930 census).
Location: South-central portion of State.
County seat: Bakersfield.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXV (Jan., 1929) : XXIX (July-Oct., 1933) : XXX : XXXIV : XXXV.

Kern County, because of its immensely productive oil fields, for many years stood preeminent among all counties of California in the value of its mineral output. It was surpassed by Los Angeles and Orange counties in 1923, but by Los Angeles only in 1924-1939, for which petroleum is responsible; it also rates fifth as a gold producing county. The 1939 production consisted of twenty different mineral substances valued at $62,105,687 compared with the 1938 output worth $71,528,574.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Clay (pottery and oil well drilling mud)	23,213 tons	$32,373
Gold	----------	3,151,015
Lead	28,542 lbs.	1,341
Natural gas	73,950,832 M. cu. ft.	5,191,065
Petroleum	58,893,865 bbls.	48,664,001
Silver	1,130,888 fine ozs.	767,633
Stone, miscellaneous	----------	158,220
Unapportioned *	----------	4,140,039
Total value		$62,105,687

* Includes antimony, bentonite, borates, brick, calcium silicate, cement, copper, gypsum, quicksilver, salt, volcanic ash, tungsten.

KINGS

Land area: 1559 square miles.
Population: 25,277 (1930 census).
Location: South-central portion of the State.
County seat: Hanford.
References: State Mineralogist Report XIV : XVII : XVIII : XXVI (Oct., 1930) : XXXV.

Kings County, previous to the discovery of Kettleman Hills oil fields in 1928, had little or no mineral output, but in 1929 it ranked

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ninth in total value of annual mineral production, seventh in 1930 and 1938, third in 1931, eighth in 1936-1937, and sixth in 1939.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Natural gas	46,054,600 M. cu. ft.	$2,526,102
Petroleum	9,871,899 bbls.	14,115,828
Quicksilver	25 flasks	2,583
Miscellaneous stone	-------	2,930
Total value		$16,647,443

LAKE

Land area: 1278 square miles.
Population: 7166 (1930 census).
Location: About fifty miles north of San Francisco Bay and the same distance inland from the Pacific Ocean.
County seat: Lakeport.
References: State Mineralogist Report XIV : XVII : XVIII : XX : XXV (July, 1929) : XXXIV : XXXV.

Lake County was in forty-first place as to the value of mineral output for 1939, with five different mineral substances, worth $451,575 compared with $281,098 in 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Quicksilver	4,155 flasks	$416,150
Mineral water	23,850 gals.	7,100
Stone, miscellaneous	22	28,290
Other minerals	-----	35
Total value		$451,575

LASSEN

Land area: 4531 square miles.
Population: 12,587 (1930 census).
Location: Northeast portion of State.
County seat: Susanville.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XXV (Jan., 1929) : XXX : XXXII (Oct., 1936).

Lassen County was in fifty-fourth place as a mineral producer for 1939, with an output of $46,277, compared with $59,546 which was the value for the previous year.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	---	$3,325
Silver	355 fine ozs.	241
Stone, miscellaneous	---	42,711
Total value		$46,277

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LOS ANGELES

Land area: 4067 square miles.
Population: 2,201,526 (1930 census).
Location: One of the southwestern coast counties.
County seat: Los Angeles.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XX : XXIII (July, 1927) : XXX : XXXIII (July, 1937) : XXXIV : XXXV.

The mineral production for Los Angeles County for the year 1939 amounted in value to $113,577,646, as compared with the 1938 total worth $125,027,054. This accounted for 32% of the entire State's total for 1939 and ranked Los Angeles first in the State as a mineral producer.

Commercial production for 1939, consisting of twenty-two substances was as follows:

Substance	*Amount*	*Value*
Brick	76,290 M.	$1,377,239
Hollow building tile	1,862 tons	20,393
Clay (pottery)	17,836 tons	46,272
Copper	2,936 lbs.	305
Gold	----------	160,440
Lead	2,183 lbs.	103
Mineral water	7,577,237 gals.	431,483
Natural gas	83,677,966 M. cu. ft.	5,877,085
Petroleum	95,906,914 bbls.	102,083,320
Silver	967 fine ozs.	656
Stone, miscellaneous	----------	2,921,561
Unapportioned *	----------	658,789
Total value		$113,577,646

* Includes cement, diatomite, dolomite, granite (volcanic rock), iodine, limestone, salt, slate, sandstone, soapstone, titanium.

MADERA

Land area: 2112 square miles.
Population: 17,152 (1930 census).
Location: East-central portion of State.
County seat: Madera.
References: State Mineralogist Report XIV : XVII : XVIII : XXIV (Oct., 1928) : XXX : XXXI : XXXIV.

Madera County was in forty-seventh place as a mineral producer for 1939, with an output of five different mineral substances valued at $119,831, compared with $29,916 for 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	---	$30,135
Silver	267 fine ozs.	181
Unapportioned *	---	89,515
Total value		$119,831

* Includes garnet, stone (miscellaneous), volcanic ash.

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MARIN

Land area: 529 square miles.
Population: 41,635 (1930 census).
Location: Adjoins San Francisco on the north.
County seat: San Rafael.
References: State Mineralogist Report XIV : XVII : XVIII : XXII (July, 1926) : XXIX : XXXV.

Marin County had forty-fifth place as to the value of mineral output for 1939, with four different mineral substances. The total was $133,756, compared with $189,843 in 1938.

Commercial production for 1939 was as follows:

Substance	*Value*
Stone, miscellaneous	$120,256
Unapportioned *	13,500
Total value	$133,756

* Includes clay (pottery and shale), mineral water.

MARIPOSA

Land area: 1453 square miles.
Population: 2530 (1930 census).
Location: Most southerly of the Mother Lode counties. East central portion of State.
County seat: Mariposa.
References: State Mineralogist Report XIV : XVII : XVIII : XXIV (April, 1928) : XXXI (Jan., 1935) : XXXV.

Mariposa County is one of the distinctly *mining* counties of the State, although it stands but twenty-fifth on the list of counties in regard to the value of its mineral output for 1939, with a total of $1,755,776, as compared with $1,588,861 for 1938. Mariposa County is also the source of a large tonnage of limestone annually, which is otherwise credited to cement manufacture in Merced County.

Commercial production with eight different mineral substances, for 1939 was as follows:

Substance	*Amount*	*Value*
Copper	3,810 lbs.	$396
Gold	-----	1,296,155
Lead	50,357 lbs.	2,367
Silver	19,418 fine ozs.	13,181
Stone, miscellaneous	-----	239,197
Unapportioned *	-----	204,480
Total value		$1,755,776

* Includes barite and granite.

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MENDOCINO

Land area: 3452 square miles.
Population: 23,491 (1930 census).
Location: Joins Humboldt County on the south and bounded by the Pacific Ocean on the west.
County seat: Ukiah.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXXV.

Mendocino County's mineral output for 1939 was valued at $47,691, which gave it a rank of fifty-third among the counties of the State as a mineral producer with $46,378 for 1938.

Commercial production for 1939 included carbon dioxide natural gas and miscellaneous stone.

MERCED

Land area: 1995 square miles.
Population: 36,900 (1930 census).
Location: About the geographical center of the State.
County seat: Merced.
References: State Mineralogist Report XIV : XVII : XVIII : XXI (April, 1925) : XXXI (Jan., 1935) : XXXV.

Merced County ranked eighteenth as to the value of mineral output for 1939, with six different substances worth $2,611,896, compared with $2,867,501 for 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	----	$1,781,325
Silver	4,743 fine ozs.	3,219
Unapportioned *	----	827,352
Total value		$2,611,896

* Includes cement, miscellaneous stone, platinum.

MODOC

Land area: 3823 square miles.
Population: 8038 (1930 census).
Location: The extreme northeast corner of the State.
County seat: Alturas.
References: State Mineralogist Report XV : XVII : XVIII : XXV (Jan., 1929) : XXX : XXXII (Oct., 1936) : XXXV.

Modoc County, in fifty-fifth place for 1939, with eight different mineral substances, reported a commercial production as follows:

Substance	*Amount*	*Value*
Gold	--	$245
Silver	4 fine ozs.	3
Stone, miscellaneous	--	17,449
Unapportioned *	--	5,961
Total value		$23,658

* Includes copper, gems, mineral water, pumice, salt.

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MONO

Land area: 3030 square miles.
Population: 1359 (1930 census).
Location: Is bordered by the State of Nevada on the east and is about in the central portion of the State measured on a north and south line.
County seat: Bridgeport.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXIII (Oct., 1927) : XXX : XXXIV : XXXV.

Mono County, in thirty-ninth place with nine different mineral substances, reported a commercial production for 1939 as follows:

Substance	*Amount*	*Value*
Gold	-----	$221,795
Silver	87,279 fine ozs.	59,243
Stone, miscellaneous	-----	112,534
Unapportioned *	-----	119,785
Total value		$513,357

* Includes andalusite, pumice, quicksilver, salt (medical), tungsten.

MONTEREY

Land area: 3330 square miles.
Population: 53,668 (1930 census).
Location: West-central portion of State, bordering on Pacific Ocean.
County seat: Salinas.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XXI (Jan., 1925) : XXXI : XXXIV : XXXV.

Monterey County had twelve different mineral substances during 1939 having a total value of $229,058 as compared with $187,144 for 1938.

In forty-third place, commercial production for 1939 was as follows:

Substance	*Value*
Stone, miscellaneous	$178,092
Unapportioned *	50,966
Total value	$229,058

* Includes diatomite, dolomite, gold, gypsum, natural gas, petroleum, quicksilver, salt, sandstone, silver.

NAPA

Land area: 783 square miles.
Population: 22,832 (1930 census).
Location: Directly north of San Francisco Bay—one of the 'bay counties.'
County seat: Napa.
References: State Mineralogist Report XIV : XVII : XVIII : XX : XXV (April, 1929) : XXXV.

In 1939 the value of Napa County's mineral output was $714,895 placing it in thirty-fourth place on the list of counties, as compared with $637,963 for 1938.

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With ten different mineral substances, commercial production for 1939 was as follows:

Substance	Amount	Value
Copper	9,667 lbs.	$1,005
Gold	------	115,710
Mineral water	94,750 gals.	12,650
Quicksilver	691 flasks	71,823
Silver	291,248 fine ozs.	197,696
Unapportioned *	------	316,011
Total value		$714,895

* Includes gems (onyx), pumice, sandstone, stone (miscellaneous).

NEVADA

Land area: 974 square miles.
Population: 10,589 (1930 census).
Location: North of Lake Tahoe on the eastern border of the State.
County seat: Nevada City.
References: State Mineralogist Report XVI : XVII : XVIII : XIX : XX : XXVI (April, 1930) : XXXI : XXXII : XXXV.

Nevada County, one of the mountain counties of California, for some years alternated with Amador in the gold lead, but both were passed by Yuba in 1918-1921, also 1923. In 1922, 1924, 1929 to 1938, Nevada led all counties in gold output, though it held third place in 1925 and 1928, and second place in 1926 and 1927. Nevada County stands eighth on the list of counties in regard to value of its mineral output for 1939 with nine different mineral substances worth $11,468,556, as compared with $11,667,896 for 1938.

Commercial production for 1939 was as follows:

Substance	Amount	Value
Copper	27,113 lbs.	$2,820
Gold	------	11,155,655
Lead	39,921 lbs.	1,876
Silver	410,826 fine ozs.	278,864
Stone, miscellaneous	------	21,446
Unapportioned*	------	7,895
Total value		$11,468,556

* Includes barite, granite, platinum.

ORANGE

Land area: 795 square miles.
Population: 118,611 (1930 census).
Location: Southwest portion of the State, bordering Pacific Ocean.
County seat: Santa Ana.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XX : XXI (Jan., 1925) : XXXI : XXXV.

Orange County, in fifth place as to value of mineral output for 1939, produced fourteen mineral substances, worth $18,850,782, compared with $21,601,082 in 1938.

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Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	25,599 tons	$108,738
Natural Gas	17,445,378 M. cu. ft.	1,185,021
Petroleum	18,314,989 gals.	17,434,038
Stone, miscellaneous	----------	95,038
Unapportioned*	----------	27,947
Total value		$18,850,782

* Includes brick, copper, gold, lead, quicksilver, salt, silica, silzer, zinc.

PLACER

Land area: 1395 square miles.
Population: 24,442 (1930 census).
Location: Eastern border of State directly west of Lake Tahoe.
County seat: Auburn.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XX : XXIII (July, 1937) : XXXI : XXXII (Jan., 1936).

Placer County, in twenty-sixth place, with eleven different mineral substances, had a commercial production for 1939 as follows, compared with $2,020,042 for the previous year:

Substance	*Amount*	*Value*
Clay (pottery)	65,322 tons	$91,081
Copper	5,719 lbs.	595
Gold	-----	1,533,945
Lead	26,409 lbs.	1,241
Silver	54,235 fine ozs.	36,814
Stone, miscellaneous	-----	20,880
Unapportioned*	-----	26,182
Total value		$1,710,738

* Includes brick and hollow building tile, granite, mineral water, platinum.

PLUMAS

Land area: 2594 square miles.
Population: 7909 (1930 census).
Location: Northeastern border of State, south of Lassen County.
County seat: Quincy.
References: State Mineralogist Report XVI : XVII : XVIII : XIX : XX : XXIV (Oct., 1928) : XXIX : XXX : XXXIII (April, 1937).

Plumas County's mineral output for 1939 with eight different mineral substances was valued at $2,265,956, as compared with $878,277 for 1938.

In twentieth place, commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Copper	8,051,386 lbs.	$837,344
Gold	--------	1,266,335
Silver	194,578 fine ozs.	132,077
Stone, miscellaneous	--------	29,778
Unapportioned*	--------	422
Total value		$2,265,956

* Includes chromite, lead, platinum.

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RIVERSIDE

Land area: 7240 square miles.
Population: 82,078 (1930 census).
Location: Southern portion of State.
County seat: Riverside.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXV (Oct., 1929) : XXX : XXXI : XXXIV : XXXV.

Riverside is the fourth county in the State in size and the fifteenth in regard to the total value of mineral output for 1939. Within its borders are included mountain, desert, and agricultural land. In point of variety Riverside County showed fourteen different mineral substances commercially produced in 1939 with a total value of $3,187,902 as compared with the 1938 output which was valued at $3,306,793.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	59,030 tons	$115,120
Copper	68,683 lbs.	7,143
Gold	------	94,395
Lead	634,071 lbs.	29,801
Silver	17,095 fine ozs.	11,604
Stone, miscellaneous	------	271,545
Unapportioned*	------	2,658,294
Total value		$3,187,902

* Includes brick and hollow building tile, cement, gypsum, granite, limestone, mineral water, silica (glass sand).

SACRAMENTO

Land area: 983 square miles.
Population: 141,915 (1930 census).
Location: North-central portion of State.
County seat: Sacramento.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXI (Jan., 1925) : XXXI.

Sacramento stands tenth among the counties of the State as a mineral producer; the output, principally gold, for 1939 being valued at $5,875,597, as compared with the 1938 production worth $4,467,487. In regard to gold output alone, this county ranks second, being exceeded by Nevada, the Sacramento product coming from the dredges. With ten mineral substances, commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	----	$5,374,935
Silver	7,519 fine ozs.	5,104
Stone, miscellaneous	----	358,557
Unapportioned*	----	117,001
Total value		$5,875,597

* Includes brick and hollow building tile, clay (pottery), granite, natural gas, paving blocks, platinum.

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SAN BENITO

Land area: 1392 square miles.
Population: 11,310 (1930 census).
Location: West-central portion of State.
County seat: Hollister.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXII (April, 1926) : XXXIV : XXXV.

San Benito County ranked thirty-eighth among the counties in regard to the value of total mining production for 1939, having an output worth $547,093 as compared with $527,192 for the previous year.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Quicksilver	3,860 flasks	$360,567
Unapportioned*	----	186,526
Total value		$547,093

* Includes bentonite, dolomite, mineral water, stone (miscellaneous).

SAN BERNARDINO

Land area: 20,157 square miles.
Population: 133,827 (1930 census).
Location: Southeastern portion of State.
County seat: San Bernardino.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XXVI (July, 1930) : XXVII (July, 1931) : XXX : XXXIV : XXXV.

San Bernardino, by far the largest county in the State in area, ranked seventh in regard to the value of mineral output for 1939, with a total of $14,664,598, as compared with $16,752,866, the total for 1938.

San Bernardino, for several years (except for 1918) had led all other counties in the State in point of variety of minerals, producing commercially in 1939 a total of twenty-seven different substances.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	8,924 tons	$44,008
Copper	43,133 lbs.	4,486
Gold	------	372,820
Lead	62,389 lbs.	2,932
Silver	189,377 fine ozs.	128,547
Stone, miscellaneous	------	173,963
Unapportioned*	------	13,937,842
Total value		$14,664,598

* Includes antimony, bentonite, borates, brick, calcium chloride, cement, ganister (used in brick), marble, iron ore, lime, limestone, lithia, mineral water, petroleum, potash, salt, soda, strontium, talc, tungsten, zinc.

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SAN DIEGO

Land area: 4221 square miles.
Population: 209,477 (1930 census).
Location: Extreme southwest corner of State.
County seat: San Diego.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXI (July, 1925) : XXX : XXXV (Jan., 1939).

San Diego County ranked thirty-seventh in the total value of its mineral output for the year 1939 with fourteen different mineral substances on the commercial list. The value for 1939 was $633,147 as compared with the 1938 output worth $535,722.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Clay (pottery)	1,126 tons	$5,386
Gold	------	14,630
Mineral water	141,745 gals	5,394
Silver	245 fine ozs.	166
Stone, miscellaneous	------	358,625
Unapportioned*	------	248,946
Total value		$633,147

* Includes brick and hollow building tile, bromine, feldspar, gems (tourmaline, kyanite and quartz crystals), granite, magnesium salts, salt, silica (quartz).

SAN FRANCISCO

Land area: 46½ square miles.
Population: 637,212 (1930 census).
County seat: San Francisco.
References: State Mineralogist Report XVII : XVIII : XX : XXV (April, 1929) : XXXV.

Surprising as it may appear at first glance, San Francisco County is listed among the mineral-producing sections of the State, actual production consisting mainly of crushed rock, sand, gravel, mineral water and gold and silver from beach sands.

In fifty-second place, commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	--	$7,840
Silver	18 fine ozs.	12
Unapportioned*	--	44,817
Total value		$52,669

* Includes mineral water, platinum, stone (miscellaneous).

SAN JOAQUIN

Land area: 1448 square miles.
Population: 102,871 (1930 census).
Location: Central portion of State.
County seat: Stockton.
References: State Mineralogist Report XIV : XVII : XVIII : XXI (April, 1925).

San Joaquin County reported a mineral production for 1939 having a total value of $1,104,898, as compared with $781,907 for 1938. In twenty-ninth place, commercial production for 1939 was as follows:

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Substance	Amount	Value
Brick and hollow building tile		$57,394
Gold		66,185
Natural gas	10,432,837 M. cu. ft.	834,694
Silver	212 fine ozs.	144
Stone, miscellaneous		146,369
Other minerals		112
Total value		$1,104,898

SAN LUIS OBISPO

Land area: 3334 square miles.
Population: 29,617 (1930).
Location: Bordered by Kern County on the east and the Pacific Ocean on the west.
County seat: San Luis Obispo.
References: State Mineralogist Report XV : XVII : XVIII : XXI (Oct., 1925) : XXXI (Oct., 1935) : XXXV.

The total value of the mineral production of San Luis Obispo County in 1939, with eleven different mineral substances, was $174,124 as compared with $242,500 in 1938.

In forty-fourth place, commercial production for 1939 was as follows:

Substance	Amount	Value
Gold	---	$490
Quicksilver	276 flasks	26,587
Stone, miscellaneous	---	22,407
Unapportioned*	---	124,640
Total value		$174,124

* Includes brick and hollow building tile, clay (oil well drilling mud), limestone, mineral water petroleum, volcanic ash, marble (limestone used for building stone).

SAN MATEO

Land area: 447 square miles.
Population: 77,338 (1930 census).
Location: Peninsula, adjoined by San Francisco on the north.
County seat: Redwood City.
References: State Mineralogist Report XVII : XVIII : XXV : (April, 1929) : XXIX : XXXV.

San Mateo County had a mineral output in 1939 of seven different substances, having a total value of $2,418,895 as compared with the 1938 production worth $2,026,217.

In nineteenth place, commercial production for 1939 was as follows:

Substance	Value
Stone, miscellaneous	$65,392
Unapportioned*	2,353,503
Total value	$2,418,895

* Includes cement, limestone (shells), magnesium salts, petroleum, salt.

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SANTA BARBARA

Land area: 2740 square miles.
Population: 65,075 (1930 census).
Location: Southwestern portion of State, adjoining San Luis Obispo on the south.
County seat: Santa Barbara.
References: State Mineralogist Report XV : XVII : XVIII : XIX : XXI (Oct., 1925) : XXXII : XXXV.

Santa Barbara County owes its position of ninth place in the State in regard to its mineral output to the presence of productive oil fields within its boundaries. The total value of its mineral production during the year 1939 was $8,911,006, as compared with the 1938 output of $10,683,722.

With nine different substances, commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Natural gas	4,594,932 M. cu. ft.	$307,732
Petroleum	8,944,217 bbls.	7,423,000
Quicksilver	74 flasks	6,876
Stone, miscellaneous	--------	70,326
Unapportioned*	--------	1,103,072
Total value		$8,911,006

* Includes bituminous rock, brick and hollow building tile, clay (pottery), diatomite, marble (limestone used for building stone).

SANTA CLARA

Land area: 1328 square miles.
Population: 144,921 (1930 census).
Location: West-central portion of State.
County seat: San Jose.
References: State Mineralogist Report XVII : XVIII : XX : XXVI (Jan., 1930) : XXIX : XXXV.

Santa Clara County reported a mineral output for 1939 of $716,346, as compared with $624,463, the figure for 1938.

In thirty-third place with seven mineral substances, commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Limestone (shells)	59,151 tons	$117,763
Quicksilver	252 flasks	26,098
Stone, miscellaneous	-----	203,978
Unapportioned*	-----	368,507
Total value		$716,346

* Includes brick, clay (pottery), magnesite, petroleum.

SANTA CRUZ

Land area: 435 square miles.
Population: 37,405 (1930 census).
Location: Bordering Pacific Ocean, just south of San Mateo County.
County seat: Santa Cruz.
References: State Mineralogist Report XVII : XVIII : XXII (Jan., 1926) : XXIX.

The mineral output of Santa Cruz County, a portion of which is itemized below, amounted to a total of $3,140,742 for 1939, giving the

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county a standing of sixteenth among all others in the State in this regard. The 1938 figure was $1,907,188.

Commercial production for 1939 was as follows:

Substance	Amount	Value
Gold	-----	$70
Limestone	34,873 tons	47,529
Stone, miscellaneous	-----	305,417
Unapportioned*	-----	2,787,726
Total value		$3,140,742

* Includes bituminous rock, cement, iron ore, lime.

SHASTA

Land area: 3858 square miles.
Population: 13,925 (1930 census).
Location: North-central portion of State.
County seat: Redding.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XXII (April, 1926) : XXIX (Jan., April, 1933) : XXX : XXXIV : XXXV (April, 1939).

Shasta County stood twenty-third in California among the mineral-producing counties in 1939, with an output valued at $2,058,547, as compared with 1938 production worth $1,791,727.

With nine mineral substances, commercial production for 1939 was as follows:

Substance	Amount	Value
Gold	-----	$1,566,810
Lead	3,790 lbs.	178
Silver	34,573 fine ozs.	23,468
Stone, miscellaneous	-----	255,839
Unapportioned*	-----	212,252
Total value		$2,058,547

* Includes copper, granite, platinum, pyrite.

SIERRA

Land area: 923 square miles.
Population: 2419 (1930 census).
Location: Eastern border of State just north of Nevada County.
County seat: Downieville.
References: State Mineralogist Report XVI : XVII : XVIII : XX : XXV (April, 1929) : XXXI.

Sierra County reported a mineral production of $871,212 in 1939, which was mainly gold, as compared with the 1938 output worth $905,237.

In thirty-first place, commercial production for 1939, was as follows:

Substance	Amount	Value
Gold	----	$864,430
Lead	4,752 lbs.	223
Silver	4,680 fine ozs.	3,177
Stone, miscellaneous	----	3,366
Other minerals	----	16
Total value		$871,212

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SISKIYOU

Land area: 6256 square miles.
Population: 25,505 (1930 census).
Location: Extreme north-central portion of State, next to Oregon boundary.
County seat: Yreka.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXI (Oct., 1925) : XXVIII (Jan., 1931) : XXIX : XXX : XXXI (July, 1935) : XXXIV : XXXV.

Siskiyou, fifth county in California in regard to size, located in highly mineralized and mountainous country, ranks twenty-fourth in regard to mineral output with nine mineral substances for 1939. The 1938 production was valued at $1,510,815.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	----	$1,708,840
Pumice	701 tons	2,888
Silver	7,615 fine ozs.	5,169
Stone, miscellaneous	----	99,906
Unapportioned*	----	30,884
Total value		$1,847,687

* Includes chromite, mineral water, platinum, tube mill pebbles.

SOLANO

Land area: 822 square miles.
Population: 40,807 (1930 census).
Location: Touching San Francisco Bay on the northeast.
County seat: Fairfield.
References: State Mineralogist Report XIV : XVII : XXIII (April, 1927) : XXXV.

Solano, while mostly valley land, produced mineral substances during the year 1939 to the total value of $640,024, ranking in thirty-sixth place among the counties of the State, compared with the 1938 output worth $431,677.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Natural gas	6,608,782 M. cu. ft.	$604,868
Unapportioned*	--------	35,156
Total value		$640,024

* Includes quicksilver, stone (miscellaneous), travertine.

SONOMA

Land area: 1577 square miles.
Population: 62,248 (1930 census).
Location: South of Mendocino County, bordering on the Pacific Ocean.
County seat: Santa Rosa.
References: State Mineralogist Report XIV : XVII : XVIII : XXII (July, 1926) : XXXV.

Sonoma County ranked forty-second among the counties of California during 1939 with a mineral output valued at $329,069, as compared with $232,495, the 1938 figure.

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Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Quicksilver	255 flasks	$27,212
Mineral water	53,860 gals.	6,949
Stone, miscellaneous	-----	284,616
Unapportioned*	-----	10,292
Total value		$329,069

* Includes clay (pottery), granite (volcanic tuft).

STANISLAUS

Land area: 1450 square miles.
Population: 56,624 (1930 census).
Location: Center of State, bounded on south by Merced County.
County seat: Modesto.
References: State Mineralogist Report XIV : XVII : XVIII : XXI (April, 1925) : XXXV.

Gold has usually been the chief mineral product of Stanislaus County, but it was exceeded in 1918-1919 by manganese, and in 1921-1923 and 1925-1930 by miscellaneous stone. This county for 1939 ranked thirtieth in the State in regard to minerals, with an output valued at $1,069,730, as compared with $845,523 in 1938.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	----	$762,685
Silver	1,748 fine ozs.	1,187
Stone, miscellaneous	----	134,276
Unapportioned *	----	171,582
Total value		$1,069,730

* Includes clay (pottery), magnesite, platinum.

SUTTER

Land area: 608 square miles.
Population: 14,618 (1930 census).
Location: Bounded by Butte County on the north and Sacramento on the south.
County seat: Yuba City.
References: State Mineralogist Report XV : XVII : XVIII.

Sutter is one of only two counties in the State which for a number of years reported no commercial output of some kind of mineral substance. In 1917 some crushed rock was taken out, from the Marysville Buttes, also in 1925-1928, and 1937-1938.

There has been some utilization of natural gas and clay. Coal is found here, but no deposits of it have been placed on a productive basis. During 1939 there was a commercial output of pottery clay and natural gas, having a total value of $68,733, which ranked it forty-ninth as a mineral-producing county.

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TEHAMA

Land area: 2893 miles.
Population: 13,839 (1930 census).
Location: North-central portion of the State, bounded on the north by Shasta.
County seat: Red Bluff.
References: State Mineralogist Report XV : XVII : XVIII : XIV : XXIV (July, 1928).

Tehama County stood forty-eighth among the mineral-producing counties of the State for 1939, with an output valued at $82,094, as compared with the 1938 yield worth $81,431.

Commercial production in 1939 was as follows:

Substance	*Amount*	*Value*
Gold	--	$31,675
Silver	68 fine ozs.	46
Stone, miscellaneous	--	44,956
Other minerals	--	5,417
Total value		$82,094

TRINITY

Land area: 3166 square miles.
Population: 2811 (1930 census).
Location: Northwestern portion of State.
County seat: Weaverville.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXII (Jan., 1926) : XXIX (Jan., April, 1933) : XXX : XXXIV : XXXV.

Trinity County's output of minerals was valued at $1,514,951 for 1939, as compared with the 1938 figure of $1,493,132, mainly due to gold which gives the county a rank of twenty-eighth for the year.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	----	$1,488,550
Silver	4,679 fine ozs.	3,176
Stone, miscellaneous	----	16,177
Unapportioned *	----	7,048
Total value		$1,514,951

* Includes copper, platinum, quicksilver.

TULARE

Land area: 4856 square miles.
Population: 77,375 (1930 census).
Location: Bounded by Inyo on the east, Kern on the south, Fresno on the north.
County seat: Visalia.
References: State Mineralogist Report XV : XVII : XVIII : XX.

Tulare County stands fortieth on the list of mineral producing counties for 1939, with eight different mineral substances, having a total value of $452,547, as compared with $273,199, the 1938 figure.

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Commercial production for 1939 was as follows:

Substance	Amount	Value
Gold		$3,255
Natural gas	1,612,221 M. cu. ft.	117,870
Silver	44 fine ozs.	30
Stone, miscellaneous		46,983
Unapportioned *		284,409
Total value		$452,547

* Includes brick and hollow building tile, petroleum, tungsten.

TUOLUMNE

Land area: 2190 square miles.
Population: 9239 (1930 census).
Location: East-central portion of State—Mother Lode District.
County seat: Sonora.
References: State Mineralogist Report XIV : XVII : XVIII : XIX : XX : XXIV (Jan., 1928) : XXXIV : XXXV.

Tuolumne County ranks thirty-fifth among the counties of the State relative to its total value of mineral output for 1939, with fourteen different substances. This county ranks first as a producer of marble in the State. The mineral production for 1939 was valued at $669,844, as compared with $1,130,263 for 1938.

Commercial production for 1939 was as follows:

Substance	Amount	Value
Copper	9,860 lbs.	$1,025
Gold		422,240
Silver	3,034 fine ozs.	2,059
Stone, miscellaneous		25,277
Unapportioned *		219,243
Total value		$669,844

* Includes chromite, lead, dolomite, granite, lime, limestone, marble, platinum, slate.

VENTURA

Land area: 1878 square miles.
Population: 54,577 (1930 census).
Location: Southwestern portion of State, bordering on Pacific Ocean.
County seat: Ventura.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXI : XXVIII (July-Oct., 1932).

Ventura is fourth in the State in respect to the value of its mineral output for 1939. The 1939 mineral production was worth $20,773,214, as compared with the 1938 output valued at $21,966,416.

With eight different mineral substances, commercial production for 1939 was as follows:

Substance	Amount	Value
Natural gas	41,098,418 M. cu. ft.	$2,038,936
Petroleum	16,866,086 gals.	18,530,769
Stone, miscellaneous		179,844
Unapportioned *		23,665
Total value		$20,773,214

* Includes clay (oil well drilling mud), gold, granite (volcanic tuft), silver.

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YOLO

Land area: 1017 square miles.
Population: 23,618 (1930 census).
Location: Sacramento Valley, bounded by Sutter on the east and Colusa on the north.
County seat: Woodland.
References: State Mineralogist Report XIV : XVII : XVIII : XXXV.

Yolo County, in fiftieth place, had a commercial production for 1939 as follows, compared with $48,232 the preceding year:

Substance	*Value*
Stone, miscellaneous	$61,056
Unapportioned *	2,087
Total value	$63,143

* Includes natural gas and quicksilver.

YUBA

Land area: 639 square miles.
Population: 11,327 (1930 census).
Location: Lies west of Sierra and Nevada counties; south of Plumas.
County seat: Marysville.
References: State Mineralogist Report XV : XVII : XVIII : XX : XXVI (July, 1930) : XXXI.

Yuba County ranked fourteenth among the counties of the State as a mineral producer and sixth in respect to gold, which is obtained mainly by dredges. The 1938 output was valued at $2,633,138.

Commercial production for 1939 was as follows:

Substance	*Amount*	*Value*
Gold	-----	$3,037,965
Silver	9,170 fine ozs.	6,224
Stone, miscellaneous	-----	147,780
Other minerals	----	87
Total value		$3,192,056

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CHAPTER VIII

DIRECTORY OF PRODUCERS OF METALLIC AND NON-METALLIC MINERALS IN CALIFORNIA 1939

NOTE.—The producers of natural gas and petroleum will be found in the Quarterly Summary of Operations, California Oil Fields, for October, November, and December, 1939 (Vol. 25, No. 2).

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ALUM (Natural)

Operator	Address	Location of mine
Riverside County		
J. T. Clapper	2221 W. Washington St., Los Angeles	Corona

ANTIMONY

Mine	Operator	Address	Location of mine
Inyo County			
Transportation Mine	William D. Wise	297 E. 3d St., San Bernardino	Death Valley Jct.
Kern County			
Alice Antimony Mine	Joseph W. Wehe	1726 36th Ave., Oakland	Havilah
San Bernardino County			
Desert Antimony Mine	A. H. Smith	153 N. Mentor Ave., Pasadena	Nipton

BARYTES

Operator	Address	Location of mine
Mariposa County		
National Lead Co., National Pigments & Chemical Division	722 Chestnut St., St. Louis, Mo.	El Portal
Nevada County		
Industrial Minerals & Chemical Co. Spanish Mine	836 Gilman St., Berkeley	Washington

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BENTONITE (FULLER'S EARTH)

Operator	Address	Location of pit
Inyo County		
W. R. Cantley	Olancha	Olancha
Kern County		
Muroc Clay Co.	5525 Randolph St., Maywood	Muroc
Filtrol Co.	1755 Downey Rd., Los Angeles	Tehachapi
San Benito County		
Stewart Property, A. B. Creek, Mgr.	1042 Vermont St., San Jose	Tres Pinos
San Bernardino County		
Walter Becker	Box 43, Red Mountain	Red Mountain
Kennedy Minerals Co.	2550 E. Olympic Blvd., Los Angeles	
National Lead Co., Nat'l Pigments & Chemical Div.	722 Chestnut St., St. Louis, Mo.	Hector
Pacific Bentonite Mine, Louis Martinez	Box 374, Red Mountain	Red Mountain
Southern Calif. Minerals Co., W. K. Skeoch	320 S. Mission Rd., Los Angeles	Kingston Mt'n
J. H. Stone	Barstow	Barstow

BITUMINOUS ROCK

Operator	Address	Location of mine
Santa Barbara County		
Buell Ranch Deposit, W. L. Smith, et al.	Buellton	Buellton
Higgins Quarry, D. A. Sattler, Lessee	856 Arguello Rd., Santa Barbara	Carpinteria
Santa Cruz County		
Calrock Asphalt Co.	525 Market St., San Francisco	Majors

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BORATES

Operator	Address	Location of property
Inyo County		
Pacific Alkali Co.	1209 Pacific Mutual Bldg., Los Angeles	Bartlett
Kern County		
Pacific Coast Borax Co.	510 W. 6th St., Los Angeles	Kramer
San Bernardino County		
American Potash and Chemical Corp.	Trona	Trona
West End Chemical Co.	Latham Square Bldg., Oakland	West End

BROMINE

Operator	Address	Location of property
Alameda County		
Westvaco Chlorine Prod. Corp.	Newark	Newark
San Diego County		
Westvaco Chlorine Prod. Corp.	Newark	San Diego

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CALCIUM CHLORIDE

Operator	Address	Location of mine
San Bernardino County		
California Rock Salt Co.	2465 Hunter St., Los Angeles	Amboy
Hollar Chemical, Inc.	2000 Santa Fe Ave., Los Angeles	Funston

CALCIUM SILICATE

Operator	Address	Location of property
Kern County		
Johns-Manville Products Corp.	Box 198, Long Beach	Code

CARBON DIOXIDE GAS

Operator	Address	Location of wells
Imperial County		
National Dry Ice Co.	Niland	Niland
Pacific-Imperial Dri-Ice, Inc., Carl M. Einhart, Pres.	Niland	Niland
Mendocino County		
Sun-Glo Dryice Corp., H. DeLotty	Box 33, Ukiah	

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CEMENT

Operator	Address	Location of mill
Calaveras County		
Calaveras Cement Co.	315 Montgomery St., San Francisco	San Andreas
Contra Costa County		
Henry Cowell Lime and Cement Co.	2 Market St., San Francisco	Cowell
Kern County		
Monolith Portland Cement Co.	Bartlett Bldg., Los Angeles	Monolith
Los Angeles County		
Blue Diamond Corp.	1650 S. Alameda St., Los Angeles	Los Angeles
Merced County		
Yosemite Portland Cement Co.	Merced	Merced
Riverside County		
Riverside Cement Co.	621 S. Hope St., Los Angeles	Riverside
San Bernardino County		
California Portland Cement Co.	601 W. Fifth St., Los Angeles	Colton
Southwestern Portland Cement Co.	503 Roosevelt Bldg., Los Angeles	Victorville
San Mateo County		
Pacific Portland Cement Co.	111 Sutter St., San Francisco	Redwood City
Santa Cruz County		
Santa Cruz Portland Cement Co.	Crocker Bldg., San Francisco	Davenport

CHROMITE

Operator	Address	Location of mine
El Dorado County		
U. S. Chrome Mines, Inc., Alwyn H. Wild	**2240 Hyde St., San Francisco**	**Folsom**
Placer County		
Daniel Sullivan	**Alta**	**Dutch Flat**

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CLAY—1939

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
Alameda County			
California Pottery Co.	a, c	Niles	Niles
N. Clark & Sons	a, b	116 Natomas St., San Francisco	Alameda
Interlocking Tile Co.	a, c	Niles	Niles
Kraftile Co.	a, b	Niles	Niles
M & S Tile Co.	a, c	Decoto	Decoto
Merrit Supply Co.	a	1289 Cedar St., Berkeley	Berkeley
F. R. Stuve	a, c	Box 26, Mt. Eden	Mt. Eden
Technical Porcelain and China Ware Co.	a	420 Kains Ave., Albany via Berkeley	Albany
Walrich Pottery	a	1285 Hearst Ave., Berkeley	Berkeley
Westinghouse Elec. & Mfg. Co., Emeryville Porcelain Works	a	62d and Green Sts., Emeryville	Emeryville
Woolenius Tiles & Mantels	a, c	1315 2d St., Berkeley	Berkeley
Amador County			
M. J. Bacon	c	Ione	Carbondale
Cal. Mineral Products Co., Ione Clay and Sand Pit	c, f	Kohl Bldg., San Francisco	Ione
N. Clark & Sons	c	116 Natomas St., San Francisco	Ione
Clay Corp. of California	c	1267 Russ Bldg., San Francisco	Ione
Ione Fire Brick Co., J. T. Roberts, Mgr.	a, b, c	1267 Russ Bldg., San Francisco	Ione
Preston School of Industry	b	Ione	Ione
Calaveras County			
California Pottery Co.	c	Niles	Valley Springs
Contra Costa County			
California Art Tile Corp.	a	Box 1116, Richmond	Richmond
Port Costa Brick Works, C. G. Berg, Pres.	b, c	6th and Berry Sts., San Francisco	Port Costa
Standard Sanitary Mfg. Co., H. W. Creeger, Mgr.	a	Box W, Richmond	Richmond
Stockton Fire Brick Co.	b	Russ Bldg., San Francisco	Pittsburg
United Materials & Richmond Brick Co., Ltd.	b	Box 7, Richmond	Richmond
Fresno County			
Craycroft Brick Co.	a, b, c	Griffith-McKenzie Bldg., Fresno	Fresno
Humboldt County			
D. J. Thompson Brick Co.	a, b, c	Box 16, Myrtle Ave., Eureka	Eureka
Inyo County			
W. R. Cantley	e	Olancha	Olancha

a. Clay products. b. Brick and hollow building-tile. c. Crude clay. d. Oil-well drilling-mud. e. Filtering clay. f. Fire sand.

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CLAY—1939—Continued

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
Kern County			
American Minerals Co.	c	2808 S. Pacific, San Pedro	Cantil
Bakersfield Rock & Gravel Co.	d	Box 395, Sta. A, Bakersfield	Bakersfield
Bakersfield Sandstone Brick Co., James Curran, Mgr.	b	Bakersfield	Bakersfield
Filtrol Company	e	1755 Downey Rd., Los Angeles	Tehachapi
C. W. Hartman	d	Bakersfield	Bakersfield
King Lumber Co.	b	1402 King St., Bakersfield	Bakersfield
Mojave Corp.	d	Box 174, Los Nietos	Muroc
Muroc Clay Co.	e	5525 Randolph St., Maywood	Muroc
Los Angeles County			
Alhambra Kilns, Inc., L. C. Merwin	a	Alhambra	Alhambra and Santa Monica
American Container Co., Inc.	a, b	3132 E. Pico Blvd., Los Angeles	Los Angeles
Angulo Tile Co., L. R. H. and W. H. Angulo	a	Reseda, Los Angeles County	Reseda
J. A. Bauer Pottery Co.	a	415 W. Ave. 33, Los Angeles	Los Angeles
J. Booth	a, c	1775 Stanford, Santa Monica	Santa Monica
Builders Brick Co., Ltd.	b	177th and Western Aves., Moneta	Moneta and Compton
City Brick Co.	b	1900 W. Manchester, Los Angeles	Los Angeles
Clayburn Brick & Tile Co., P. G. Lingren, Mgr.	b	1376 W. 25th St., Long Beach	Long Beach
Coast Brick Co.	b	Torrance	Torrance
H. F. Coors Co., Inc.	a	Inglewood	Inglewood
Davidson Brick Co.	b, c	4701 Floral Dr., Los Angeles	Los Angeles
Eljer California Co.	a	4100 Alameda, Los Angeles	Arcadia
Emsco Refractories Co.	a, b	5601 S. Boyle Ave., Vernon	Vernon
Gladding, McBean & Co., Tropico, L. A. & S. M. Plants	a, b, c	2901 Los Feliz Blvd., Los Angeles	Tropico, Los Angeles, Santa Monica, Hermosa Beach and Vernon
Higgins Brick & Tile Works	a, b, c	Box 525, Moneta	Moneta
Italian Terra Cotta Co.	a	1149 Mission Rd., Los Angeles	Los Angeles
Markoff Mosaic Tile Corp.	a	1107 E. Redondo Blvd., Inglewood	Inglewood
Meyers Pottery Co.	a	2318 E. 52d St., Los Angeles	Los Angeles
Pacific Clay Products	a, b, c	Box 145, Sta. A, Los Angeles	Los Angeles and Los Nietos
Pacific Tile & Porcelain Co.	a, c	3428 W. Pico Blvd., Los Angeles	Los Angeles and Los Nietos
Pomona Brick Co.	b	Pomona	Pomona
Pomona Tile Mfg. Co.	a	Pomona	Pomona
San Vallee Tile Kilns, R. F. Stubver, Mgr.	a, c	6601 Wilbur, Reseda	Reseda
St. Louis Fire Brick and Clay, Joseph Mesmer	b	3050 E. Slauson St., Los Angeles	Los Angeles
Simons Brick Co., Walter R. Simons	a, b, c	1195 S. Boyle Ave., Los Angeles	Los Angeles
Star Brick Co.	b	Moneta	Moneta
Tillotson Clay Products	a, b	3363 Fruitland Rd., Vernon	Vernon
Vernon Potteries	a	2300 E. 52d St., Los Angeles	Vernon
Virtefrax Co.	a, b, c	5050 Pacific Blvd., Los Angeles	Los Angeles

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Marin County			
McNear Brick Co.	a, c	McNear Point, San Rafael	McNear
Orange County			
El Toro Clay Co., I. P. Arnold	c, f	1846 W. 83d St., Los Angeles	El Toro
Gladding, McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Gypsum
La Bolsa Tile Co.	a, c	R.F.D. 1, Box 174, Huntington Beach	Smeltzer
Mission Clay Products Co.	a, b, c	Olive	Olive
Tierra Colorado Clay Co.	c	Box 473, San Juan Capistrano	San Juan Capistrano
Placer County			
Clay Corp. of Calif.	c	1267 Russ Bldg., San Francisco	Lincoln
Gladding, McBean & Co.	a, b, c	2901 Los Feliz Blvd., Los Angeles	Lincoln
Lincoln Clay Products Co.	c	Lincoln	Lincoln
Riverside County			
Alberhill Coal & Clay Co.	c	Box 4267, Village St., Los Angeles	Alberhill
Los Angeles Brick Co.	a, b, c	1078 Mission Rd., Los Angeles	Alberhill
Pacific Clay Products	c	Box 145, Sta. A., Los Angeles	Corona
Temescal Clay Co.	c	5601 S. Boyle Ave., Los Angeles	Temescal
Sacramento County			
Cannon & Co.	a, b, c	Box 802, Sacramento	Ben Ali
H. C. Muddox, Jessie E. Muddox, Owner	a	30th and L Sts., Sacramento	Sacramento
Panama Pottery Co.	a	R.F.D. 4, Box 1478, 24th St. Rd., Sacramento	Sacramento
Sacramento Brick Co.	b	1300 Front St., Sacramento	Sacramento
San Benito County			
Stewart Property, A. B. Creek, Mgr.	e	1042 Vermont St., San Jose	Tres Pinos
San Bernardino County			
Mr. Walter Becker	e	Box 43, Red Mountain	Red Mountain
Hancock Brick Yard, C. P. Hancock & Son	b	4330 Lemon St., Riverside	Highgrove
Hart Clay Co., W. K. Skeoch, Lessor	c	2022 Thayer Ave., Los Angeles	Goffs
Kennedy Clay Pit, John Kennedy	c	5009 O'Sullivan Dr., Los Angeles	Daggett
Kennedy Minerals Co.	e	2550 E. Olympic Blvd., Los Angeles	Colton
Murphy Silica Products Co.	c	1514 Hooper Ave., Los Angeles	Oro Grande
National Lead Co., Nat'l Pigments & Chemical Div.	d, e	722 Chestnut St., St. Louis, Mo.	Hector
Pacific Bentonite Mine, Louis Martinez	e	Box 374, Red Mountain	Red Mountain
C. Solomon, Jr.	c	2457 Scott St., San Francisco	Barstow
Southern California Minerals Co., W. K. Skeoch	e	320 S. Mission Rd., Los Angeles	Kingston Mtn.
Standard Sanitary & American Radiator Corp., Pacific Mines	c	Campo	Hart
J. H. Stone	e	Barstow	Barstow
Temescal Clay Co.	g	5601 S. Boyle Ave., Vernon	Hicks
Velvet-White Mines, B. Driscoll	c	4721 Second Ave., Los Angeles	Oro Grande
San Diego County			
Pacific Clay Products Co.	c	Box 145, Station A, Los Angeles	Farr Station
Union Brick Co., J. W. Rice	b	3565 3d St., North San Diego	Rose Canyon
Vitrified Products Corp.	a, b, c	4570 Pacific Highway, San Diego	North San Diego

a. Clay products. b. Brick and hollow building-tile. c. Crude clay. d. Oil-well drilling-mud. e. Filtering clay. f. Fire sand. g. Ganister.

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CLAY—1939—Continued

(Including producers of crude clay; and manufacturers of brick, tile, porcelain, etc.)

Operator	Remarks	Address	Location of plant or pit
San Joaquin County			
Joaquin Pottery	a	McKinley Ave., Stockton	Stockton
San Joaquin Brick Co., J. F. Stein, Secretary	b	33 S. El Dorado St., Stockton	Stockton
Stockton Brick & Tile Co	a, b, c	McKinley Ave., Stockton	Stockton
San Luis Obispo County			
Antelope Mud Co., W. G. Angus, Mgr.	d	Box 204, Lost Hills	Cholame
San Luis Brick Works, Faulstick Bros.	b	San Luis Obispo	San Luis Obispo
San Mateo County			
Richmond Potteries, Inc.	a	Box 187, South San Francisco	South San Francisco
Santa Barbara County			
McNall Building Materials	a, b, c	208 N. Salsipuedes, Santa Barbara	Santa Barbara
Parker Brick Co., J. Y. Parker	a, b, c	303 Ladera St., Santa Barbara	Santa Barbara
Santa Clara County			
Coyote Creek Clay Beds, L. R. Lenfest	c	1195 E. Santa Clara St., San Jose	San Jose
Garden City Pottery	a	560 N. 6th St., San Jose	San Jose
Gladding Bros. Mfg. Co.	a, b, c	S. 3d and Keyes Sts., San Jose	San Jose
Handcraft Tile Co., L. W. Austin, et al.	a	R.F.D. 2, Box 121A, San Jose	San Jose
Myers Ceramic Pottery, A. Clay Myer	a	Box 97, Santa Clara	Santa Clara
Remillard-Dandini Co	b	569 3d St., Oakland	San Jose
S. & L. Tile Co.	a	1881 S. 1st St., San Jose	San Jose
Sonoma County			
Clay Corp. of Calif.	c	1267 Russ Bldg., San Francisco	Glen Ellen
Stanislaus County			
Coopertown Clay Deposit, J. H. Hornsby	c	651 Cumberland St., Pittsburg	Coopertown
V. J. Winkler	c	2332 Fulton St., Berkeley	Knights Ferry
Sutter County			
Gladding, McBean & Co.	c	2901 Los Feliz Blvd., Los Angeles	Nicolaus
Tulare County			
San Joaquin Materials Co.	b	744 G St., Fresno	Exeter
Ventura County			
Hercules Rotary Mud Co., Selby Shale Pit	d	2000 N. Ventura Ave., Ventura	Ventura
Shell Oil Co., Dent Clay Pit	d	Shell Bldg., San Francisco	Ventura

a. Clay products. b. Brick and hollow building tile. c. Crude clay. d. Oil-well drilling-mud. e. Filtering clay. f. Fire sand.

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COAL

Operator	Address	Location of mine
Contra Costa County		
Diablo Coal Co., Claud Kidwell, C. Fabyen & Wm. Timm	2125 Bonar St., Berkeley	Concord

COPPER

Principal Copper Producers in California during 1939

Mine	Operator	Address	Location of mine
Imperial County			
American Girl	Allied Mines, Inc.	9176 Sunset Blvd., Los Angeles	Ogilby
Inyo County			
Pine Creek	U. S. Vanadium Corp.	Laws	Bishop
Napa County			
Grigsby (Palisades)	Graham & Loftus Oil Corp.	811 W. 7th St., Los Angeles	Calistoga
Nevada County			
Lava Cap	Lava Cap Gold Mining Corp.	Box 780, Nevada City	Nevada City
Spanish	Bradley Mining Co.	922 Crocker Bldg., San Francisco	Washington
Plumas County			
Walker	Walker Mining Co.	821 Kearns Bldg., Salt Lake City, Utah	Walkermine
Riverside County			
Black Eagle	Imperial Smelting & Ref. Co.	811 W. 7th St., Los Angeles	Indio
San Bernardino County			
Kelly	F. W. Royer, et al.	Red Mountain	Red Mountain

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DIATOMITE (DIATOMACEOUS EARTH)

Operator	Address	Location of quarry or mine
Los Angeles County		
The Dicalite Co.	756 S. Broadway, Los Angeles	San Pedro
Monterey County		
Pacatome, Ltd.	Bradley	Bradley
Santa Barbara County		
Johns-Mansville Products Corp.	Lompoc	Lompoc

DOLOMITE

Operator	Address	Location of quarry
Inyo County		
Inyo Marble Co.	726-732 E. 29th St., Los Angeles	Keeler
Los Angeles County		
W. F. Glasser, Inc.	713 N. Sepulveda, Brentwood Heights, Los Angeles	Bel-Air
Monterey County		
Pacific Coast Steel Corp., Sterling Ranch Quarry	20th and Illinois Sts., San Francisco	Natividad
San Benito County		
Archie E. Hamilton	Hollister	Hollister

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FELDSPAR

Operator	Address	Location of mine
Fresno County		
Industrial Minerals & Chemical Co.	836 Gilman St., Berkeley	Friant
San Diego County		
American Radiator & Standard Sanitary Corp., D. D. Fleming, Mgr.	Campo	Campo

GARNETS

Operator	Address	Location of quarry or mine
Inyo County		
Tungsten Milling Co., Raymond A. Stolle	Box 461, Bishop	Bishop

GEMS AND JEWELERS' MATERIALS

Operator	Variety	Address
C. M. Carter	Topaz	553 27th St., Oakland
W. C. Eyles	Petrified wood, onyx, chalcedony	794 W. A St., Hayward
Robert J. Graham	Iridescent obsidian	Davis Creek
H. F. Heather	Iceland-spar	236 Oak Knoll Ave., Pasadena
Pala Chief Mine, Margaret S. Moore & M. Wear	Tourmaline, Kunzite, quartz crystals	Box 33, Pala
J. W. Ware	Tourmaline	1050 6th St., San Diego

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GOLD

Principal gold producers in California out of a total of 1,777 placer operators and lode mines in 1939

Mine	Type of mine	Operator	Address	Postoffice of mine
Amador County				
Arata property	e	Gold Hill Dredging Co. (Camanche Gold Dredging Co. to Oct. 13)	311 California St., San Francisco	Camanche
Argonaut	a	Argonaut Mining Co., Ltd.	1404 Humboldt Bank Bldg., San Francisco	Jackson
Arroyo Seco	e	Arroyo Seco Gold Dredging Co.	351 California St.	Ione
Ballard, et al.	h	Placeritas Mining Co. (W. D. Ingram)	Plymouth	Plymouth
Buena Vista Dredge No. 3	e	Lancha Plana Gold Dredging Co.	Camanche	Camanche
Central Eureka & Old Eureka	a	Central Eureka Mining Co.	111 Sutter St., San Francisco	Sutter Creek
Delta Tailings Dump	c	Delta Tailings Co.	564 Market St., San Francisco	Ione
E. A. Kent Dredge No. 2	h	E. A. Kent	P.O. Box 391, Stockton	Volcano
Fremont Gover	a	Fremont Gover Co.	Amador City	Amador City
Garibaldi	k	Garibaldi Bros.	Volcano	Volcano
Horton	g	H. G. Kerth	Ione	Ione
Italian	a	Black Hills Mining Co.	Jackson	Jackson
Kennedy	a	Kennedy Mining & Milling Co.	519 California St., San Francisco	Martell
Keystone	a	Keystone Mine Syndicate	Amador City	Amador City
Lorentz	h	E. L. Lilly	706 California St., San Francisco	Ione
Plymouth Tails Dump	c	Argonaut Mining Co., Ltd.	1404 Humboldt Bank Bldg., San Francisco	Plymouth
Rim Cam Dredge	h	Rim Cam Dredging Co.	Ione	Ione
River Pine	h	River Pine Mining Co.	Plymouth	Plymouth
San Andreas Gold Dredge	h	San Andreas Gold Dredging Co.	960 Russ Bldg., San Francisco	Ione
Universal Dredge	h	Universal Dredging Corporation	San Andreas	San Andreas
Wolin-Hall	h	Wolin-Hall et al.	Plymouth	Plymouth
Butte County				
Baker & McCowan	h	Baker & McCowan	Box 305, Chico	Chico
Butte Unit Yuba Cons. Dredge	e	Yuba Consolidated Gold Fields	351 California St., San Francisco	Rio Bonito
Ette Fitts property	k	Humphreys Gold Corporation	Box 528, Chico	Chico
Feather River Bar	h	Golden Feather Dredging Co.	1015 25th, Sacramento	Oroville
Granella Ranch	h	Lord & Bishop	Box 812, Sacramento	Oroville
Hodapp Land	k	L. L. Neal	663 Eastwood Ave., Chico	Chico
Miller property	h	Gibson Mining Co.	R.F.D. 2, Box 29, Oroville	Oroville
Piombo dredge	h	Piombo Bros. & Company	1571 Turk St., San Francisco	Oroville
Richter & Sons dredge	h	William Richter	R.F.D. 2, Box 318, Oroville	Oroville
Surcease	a	Hoefling Bros.	P.O. Box 786, Sacramento	Yankee Hill
Thompson Flat	h	Table Mountain Dredging Co.	Redding	Thompson Flat
Wilton Kister et al. property	e	Gold Hill Dredging Co.	311 California St., San Francisco	Loomis
Calaveras County				
Airola-Costa, et al.	h	San Andreas Gold Dredging Co.	960 Russ Bldg., San Francisco	San Andreas
Big Springs	a	C. E. Gruwell	Angels Camp	Angels Camp
Brunner	a	Brunner Mining Co.	5050 Mission St., San Francisco	Angels Camp
California Gold Dredge	e	California Gold Dredging Co.	351 California St., San Francisco	Linden

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Carson Hill	a	Carson Hill Gold Mining Corporation	Melones	Melones
Comet	a	Comet Quartz Mine, Inc., et al	San Andreas	San Andreas
Continental	a	Henry S. Wardell	Westpoint	Westpoint
Coyote Creek	h	R. & M. Mining Co.	Douglas Flat	Douglas Flat
Dickhart Ranch, et al	e	C. J. Thompson	Linden	Linden
Easy Bird	a	Le Roi Mines, Inc.	Jackson	Jackson
A. R. Folsom property	e	Wallace Dredging Co.	311 California St., San Francisco	Camanche
Gruwell Dredge	h	C. E. Gruwell	Angels Camp	Angels Camp
Hinkle property, et al	k	Pacific Placers Engineering Co.	1736 Standard Ave., Glendale	Valley Springs
Houston Bros. dredge	h	Houston Bros.	R.F.D. 1, Box 15, Lodi	Vallicita
E. A. Kent Dredge No. 1	h	E. A. Kent	P.O. Box 391, Stockton	Angels Camp
Lancha Plana Dredge No. 2	e	Lancha Plana Gold Dredging Co.	Camanche	Camanche
Lloyd	f	Calaveras Land Co.	621 W. Acacia St., Stockton	San Andreas
Lord & Bishop Dredge	h	Lord & Bishop	Box 812, Sacramento	Camanche
Mehrten Bros. Dredge	k	L. C. & Charles Mehrten	Box 143, Camanche	Camanche
Mountain King	a	Jumbo Consolidated Mining Co.	Copperopolis	Copperopolis
Right Bower	a	Western Quartz Mining Co.	203 1st National Bank Bldg., San Jose	
Rim Cam Dredge	h	Rim Cam Gold Dredging Co.	Mokelumne Hill	Mokelumne Hill
Royal	a	Frank S. Tower	Milton	Milton
Sheep Ranch	a	St. Joseph Lead Co.	Sheepranch	Sheepranch
South Gulch	h	Milton Gold Dredging Enterprise	405 Montgomery St.	Milton
South Gulch Placers	h	South Gulch Placers & General Gold Corporation	505 Bank of America Bldg., Sacramento	Milton
Universal Dredge	h	Universal Dredging Corporation	Ione	Ione
Vallecito Western	f & h	Vallecito Mining Co., Inc.	Murphys	Angels Camp
El Dorado County				
Alhambra	a	Alhambra-Shumway Mines, Inc.	Kelsey	Kelsey
Beebe-Eureka	a	Beebe Gold Mining Co.	1022 Crocker Bldg., San Francisco	Georgetown
Big Canyon	a	The Mountain Copper Co., Ltd.	351 California St., San Francisco	Shingle
Big Canyon Dredge	h	Big Canyon Dredging Co.	2150 G St., Fresno	Shingle
Black Oak	a	Russell J. Wilson	Garden Valley	Garden Valley
Clarksville	k	F. O. Bohnett	1331 Santa Barbara St., Santa Barbara	Clarkville
Eldorado Crystal	a	Eldorado Crystal Mine	Shingle	Shingle
Emily Pletz property	k	Siels Bros.	100 Parkside Terrace, Auburn	Auburn
General dredge No. 2	h	General Dredging Corporation	505 Bank of America Bldg., Sacramento	Lotus
Greenwood Creek	h	McQueen & Downing, et al	Box 68, Weaverville	Lotus
Horseshoe Dredge	h	Horseshoe Dredging Co.	Youngs	Placerville
Logtown Ravine	h	Hoosier Gulch Placers	1317 23d St., Sacramento	Sacramento
Lemroh Dredge	h	Lemroh Mining Co.	2401 Bayshore Blvd., San Francisco	Placerville
Middle End	a	Cosumnes Mines, Inc.	Grizzly Flats	Grizzly Flats
Muir	k	Muir Placer Mine	Rescue	Rescue
Rocky Bar	k	Clarence Young	544 Tennyson Ave., Palo Alto	Fairplay
Rosecranz	a	Lode Development Co.	P.O. Box 788, Auburn	Auburn
Sliger	a	Middle Fork Gold Mining Co.	Box M, Auburn	Auburn
Stuckslager	a	E. J. McKenney	2704 D St., Sacramento	Lotus
Taylor	a	Lode Development Co.	Garden Valley	Garden Valley

a. Lode gold mine. b. Gold-Silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucket line). f. Drift mine. g. Hydraulic mine. h. Dragline operations. j. Copper-Gold mine. k. Power shovel or dry land dredge. m. Lead mine.

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GOLD—Continued

Principal gold producers in California out of a total of 1,777 placer operators and lode mines in 1939

Mine	Type of mine	Operator	Address	Postoffice of mine
Humboldt County				
Young	k	Frederick Gold Mining Co., et al.	Willow Creek	Willow Creek
Imperial County				
American Girl	a	Allied Mines, Inc.	9176 Sunset Blvd., Los Angeles	Ogilby
Cargo Muchacho	a	Holmes & Nicholson Mg. & Mg. Co.	Box 451, Winterhaven	Ogilby
Desert Gold	k	Desert Gold & Aluminum Corp.	5147 Arcade Bldg., Seattle	Yuma, Ariz.
Mary Lode Mine No. 1	a	Mary Lode Mines	P.O. Dr. 442, El Centro	El Centro
Sovereign	a	Sovereign Development Co.	Ogilby	Ogilby
Inyo County				
Arondo	a	Argus Mining Co.	650 S. Grand Ave., Los Angeles	Trona
Del Norte	a	Louis Marklewitz et al.	Mojave	Mojave
Gold Bug	a	W. M. Atkinson	Red Mountain	Trona
Gold King	a	P. H. Greer Co., Inc.	Randsburg	Trona
Inyo	a	Inyo Consolidated Mines, Inc. et al.	Death Valley	Death Valley
Margaret	a	Don H. & V. D. Clair	Box 51, Trona	Trona
Reward (Brown Monster)	a	T. L. Bright et al.	Bigpine	Independence
Ruth	a	Burton Bros., Inc.	Rosemond	Trona
Skidoo	a	Tony Gomez et al.	Trona	Trona
Kern County				
Big Blue-Lady Belle	a	Kern Mines, Inc.	Kernville	Kernville
Big Butte	a	Butte Lode Mining Co.	1231 Roosevelt Bldg., Los Angeles	Mojave
Big Dyke	a	J. D. Shea, et al.	Randsburg	Randsburg
Cactus Queen	b	Cactus Mines Co.	Rosamond	Rosamond
Eureka	a	Morris Albertoli, et al.	Mojave	Mojave
Fairview	a	E. W. Little, et al.	Rosamond	Mojave
Four Jacks	b	Eric Fallen, et al.	Rosamond	Rosamond
Four Star	a	Pride of Mojave Mg. Corporation	Mojave	Mojave
Gwynne	a	Geringer Bros.	Mojave	Mojave
Golden Queen	a	Golden Queen Mining Co.	Mojave	Mojave
King Solomon	a	King Solomon Mines Lease	Johannesburg	Randsburg
Lucky Boy	a	T. B. Peterson, et al.	Randsburg	Randsburg
Middle Butte	a	George Stemwedel, et al.	Mojave	Mojave
Monarch Rand	a	Monarch Rand Mining Co.	Randsburg	Randsburg
Operator	a	Operator Consolidated Mines Co.	Randsburg	Randsburg
Standard	a	A. J. Bruce	Mojave	Mojave
Starlight (Lode Star)	a	Lode Star Mining Co.	Mojave	Mojave
Tropico	a	Burton Bros., Inc.	Rosamond	Rosamond
Wade No. 2 (W. H.)	a	Glen Hatton, et al.	Red Mountain	Red Mountain
Whitmore	b	Whitmore Mines, Inc.	405 S. Hill St., Los Angeles	Mojave
Yellow Aster	a & c	Anglo-American Mining Corporation, Ltd.	206 Sansome St., San Francisco	Randsburg
Yellow Dog	a	Jack Holt, et al.	Mojave	Mojave

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Los Angeles County				
Governor	a	Governor Mine Co.	725 S. Figueroa St., Los Angeles	Acton
Mariposa County				
Bandarita	a	Bandarita Mining Co.	Box 81, Coulterville	Coulterville
Bondurant	a	Bondurant Mg. & Mg. Co.	405 Montgomery St., San Francisco	Coulterville
Campo	a	Campo Mine	Hornitos	Hornitos
Cotton Creek	a	Cotton Creek Mining Co.	707 MacDonald Ave., Richmond	Hornitos
Granite King	a	Buckeye Mining Co.	Mariposa	Mariposa
Joice-Murray Dredge	h	Joice, Joice & Murray Co.	Box 201, Le Grand	Le Grand
Melvina	a	Boston California Mining Co.	Sonora	Coulterville
Miocene No. 2 & Gold Bug	a	N. D. Madden	Coulterville	Coulterville
Mount Gains	a	Mount Gains Mining Co.	Hornitos	Hornitos
Nutmeg	a	C. O. Willey	Mariposa	Mariposa
Original & Ferguson	a	San Juan Ramsey Co.	P.O. Box 30, Incline	Incline
Our Chance	a	A. E. Clark & E. R. Baker	Box 71, Mariposa	Mariposa
Pine Tree & Josephine	a	Pacific Mining Co.	1022 Crocker Bldg., San Francisco	Bear Valley
Placer Properties	h	Placer Properties Co.	Oakdale	Le Grand
Quail	a	Quail Gold Mines, Inc.	Coulterville	Coulterville
Red Bank	a	Red Bank Mine (Fred W. Draper)	Bagby	Bagby
Trebor Dredge	h	Trebor Corporation	Box 51, Mariposa	Mariposa
Washington	a	Mariposa-Washington Mining Co.	Hornitos	Hornitos
Merced County				
P. H. Bottoms Dredge	h	B. & W. Mining Co.	1146 P St., Fresno	Merced Falls
Merced Dredge No. 1	e	Merced Dredging Co.	Mills Bldg., San Francisco	La Grange
Merced Unit	e	Yuba Consolidated Gold Fields	351 California St., San Francisco	Snelling
San Joaquin Dredge No. 1	e	San Joaquin Mining Co.	1805 Mills Tower, San Francisco	La Grange
Snelling Dredge No. 1 & 2	e	Snelling Gold Dredging Co.	Snelling	Snelling
Mono County				
Log Cabin	a	Mutual Gold Corporation, et al.	401 Fernwell Bldg., Spokane, Wash.	Leevining
Standard	b	Roseklip Mines Co.	206 Sansome St., San Francisco	Bodie
Napa County				
Grigsby (Palisades)	b	Graham & Loftus Oil Corporation	811 W. 7th St., Los Angeles	Calistoga
Nevada County				
Ace in Hole	a	E. N. Costello, et al.	Nevada City	Nevada City
Alpha Stores property	h	Pilot Dredging Co.	Nevada City	Nevada City
Atlas Dredge	h	Atlas Gold Dredging Corporation	712 Edison Bldg., Los Angeles	Grass Valley
H. C. Black Property	h	Climax Dredging Co.	Box 578, Grass Valley	Grass Valley
Bullion	a	Grass Valley Bullion Mines, Inc.	Box 1028, Grass Valley	Grass Valley
Champion Flat	h	Dakin Co.	Box 1086, Nevada City	Nevada City
Empire Star Group	a	Empire Star Mines Co., Ltd.	14 Wall St., New York City, N. Y.	Grass Valley
Gleason Ranch, et al.	k	John C. Pantle	Lincoln	
Giant King	a	Washington Giant King Mines, Inc.	Nevada City	Nevada City
Golden Center	a	Cooley Butler	745 Rowan Bldg., Los Angeles	Grass Valley
Great Northern (Hoge)	a	Great Northern Gold Mines, Inc.	310 Broad St., Nevada City	Nevada City

a. Lode gold mine. b. Gold-Silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucket line). f. Drift mine. g. Hydraulic mine. h. Dragline operations. j. Copper-Gold mine. k. Power shovel or dry land dredge. m. Lead mine.

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GOLD—Continued

Principal gold producers in California out of a total of 1,777 placer operators and lode mines in 1939

Mine	Type of mine	Operator	Address	Postoffice of mine
Nevada County—Continued				
Greenhorn Dredge	h	Greenhorn Dredging Co., et al.	Colfax	Nevada City
Green Mountain	a	James Kistle	Nevada City	Nevada City
Idaho Maryland	a	Idaho Maryland Mines Corporation	Russ Bldg., San Francisco	Grass Valley
Innis Dredge	h	Innis Dredging Co.	Nevada City	Nevada City
Lava Cap	a	Lava Cap Gold Mining Corporation	Box 780, Nevada City	Nevada City
Little York	k	Minnis & Moody, et al.	Dutch Flat	Dutch Flat
Martel Ranch	h	Calneva Mining Co.	Nevada City	Nevada City
Scotts Flat Creek	h	William Richter	Oroville	Nevada City
Shorty Jefferies	k	F. R. Croft, et al.	Grass Valley	Grass Valley
Spanish	a	Bradley Mining Co.	922 Crocker Bldg., San Francisco	Washington
Placer County				
Alabama	a	Alabama California Gold Mines Co.	Box 155, Auburn	Penryn
Auburn Ravine, et al.	k	Pantle Bros.	Lincoln	Lincoln
Chabot property	e	Gold Hill Dredging Co.	311 California St., San Francisco	Loomis
Comstock Ranch, et al.	h	Henry Aalders, et al.	Lincoln	Lincoln
Crossely, et al.	k	F. O. Bohnett	Santa Barbara	Loomis
A. E. Day property, et al.	k	Panob Gold Dredging Co.	Loomis	Loomis
Eclipse	a	Ophir Nevada Mining & Milling Co.	Auburn	Auburn
Finney Ranch, et al.	k	Walter R. Jansen	Lincoln	Lincoln
Gaylord-LaValle	f	Jose Oro Mining Co., et al.	Auburn	Auburn
Guilford Ranch	h	Fay Placer Mine	Lincoln	Lincoln
Midland Dredge	h	Midland Company	733 Dwight Way, Berkeley	Lincoln
Oro Bell	e	Oro Bell Dredging Co.	2466 Virginia St., Berkeley	Loomis
Oro Fino	a	Oro Fino Consolidated Mines	Box V, Auburn	Auburn
Rawhide	a	Canyon Mines Corporation	Baxter	Baxter
Recalp	h	Jasper-Stacy Co.	216 Pine St., San Francisco	Lincoln
Rizzi	k	Charles N. Chittenden	Lincoln	Lincoln
Sisley	a	Burm-Ball Mining Co.	Box 306, Auburn	Auburn
Strawberry	f	G. F. Hodgins	200 Bush St., San Francisco	Lincoln
Volcano	f	Volcano Mining Co., Ltd.	Foresthill	Foresthill
	a	A. C. Crosby	Lincoln	Lincoln
Plumas County				
Cherokee	a	Alfred L. Merritt, et al.	Box 215, Greenville	Greenville
Droege & New York	a	North Canyon Mines, Inc.	Greenville	Greenville
Gray's Flat	h	Lord & Bishop	Box 812, Sacramento	Rich Bar
Imperial	a	Gerald R. Simpson	Quincy	Quincy
Morning Star & Trenton Group	a	E. C. Robinson	629 Edison Bldg., Los Angeles	Berry Creek
Ohio Point	a	Virgilia Mining Corporation	Virgilia	Virgilia
Standart	a	Indian Valley Mining Co.	Greenville	Greenville
Walker	j	Walker Mining Co.	821 Kearns Bldg., Salt Lake City, Utah	Walkermine

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Riverside County				
Black Eagle	a	Imperial Smelting & Refining Co.	811 W. 7th St., Los Angeles	Indio
Golden Rod 1 & 2	a	O, K. Mining Co.	Indio	Indio
Ida Leona	a	Ida Leona Mg. & Mg. Co.	Box 55, Perris	Perris
Sacramento County				
Capital	e	Capital Dredging Co.	351 California St., San Francisco	Folsom
Cosumnes Dredge	e	Cosumnes Gold Dredging Co.	351 California St., San Francisco	Sloughhouse
General Dredge 1 & 3	h	General Dredging Corporation	505 Bank of America Bldg., Sacramento	Folsom
Hoosier Gulch, et al.	h	Hoosier Gulch Placers	1317 23d St., Sacramento	Folsom
Humphreys Dredge	k	Humphreys Gold Corporation	Sloughhouse	Sloughhouse
Natomas	e	Natomas Company	Box 1197, Sacramento	Natoma
San Bernardino County				
Aero Trust	a	Jerry Korfist	Baker	Baker
Carlyle	a	Camco Mining Co.	3715 W. 27th St., Los Angeles	Twenty-nine Palms
Gold Crown	a	Gold Crown Mining Co., Ltd.	714 W. Olympic Blvd., Los Angeles	Twenty-nine Palms
Holcomb Valley Placer	k	Holcomb Valley Placer Co.	973 N. Main St., Los Angeles	Big Bear Lake
Kelly	b	F. W. Royer, et al.	Red Mountain	Red Mountain
Ramsey (Wheeler)	a	Ramsey Mining Company	Lucerne Valley	Lucerne Valley
Santa Fe	a	Santa Fe Gold Mines, Inc.	Box 668, Victorville	Victorville
Telegraph	a	Telegraph Mines, Inc., et al.	Baker	Baker
San Diego County				
Ranchito	a	William Martin	Hemet	Julian
San Joaquin County				
Watkins Dredge	h	A. G. Watkins & Sons	Linden	Linden
Shasta County				
Brunswick	a	F. B. Russi, et al.	French Gulch	French Gulch
China Gulch	h	Roy S. Olson	1178 Walnut Ave., Redding	Redding
Churn Creek	k	E. N. Sewell	Redding	Redding
Clear Creek Dredge	h	Clear Creek Dredging Co.	Redding	Redding
Clear Creek	h	Lord & Bishop	Box 812, Sacramento	Redding
Dry Creek	h	Baker & McCowan	Box 305, Chico	Chico
East Fork	k	East Fork Mining Co.	French Gulch	French Gulch
Gas Point	h	Cinco Mineros Co.	Box 212, Oroville	Redding
Iron Mountain	a	The Mountain Copper Co.	351 California St., San Francisco	Matheson
Mad Ox	a	E. L. Brown	Schilling	Schilling
J. F. Moore property, et al.	h	Pilot Dredging Co.	Redding	Redding
Philadelphia, et al.	a	A. P. Robillard	French Gulch	French Gulch
Piombo Dredge	h	Piombo Bros. & Co.	1571 Turk St., San Francisco	Redding
Pioneer Dredge	h	Pioneer Dredging Co.	Box 700, Redding	Redding
Reid	a	Old Diggings Consolidated Mines	Redding	Redding
Rice property	h	El Oro Dredging Co.	Box 77, Cottonwood	Cottonwood
Roaring River	e	Roaring River Gold Dredging Co.	355 California St., San Francisco	Cottonwood
Sulphur Creek	h	Lord & Bishop & Carlson & Sandburg	Box 812, Sacramento	Redding
Walker	a	I. J. Finberg	Box 983, Redding	Redding
Washington	a	J. H. Scott Co.	465 California St., San Francisco	French Gulch
Wertz & Turner	h	Lincoln Gold Dredging Co.	Lincoln	French Gulch

a. Lode gold mine. b. Gold-Silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucket line). f. Drift mine. g. Hydraulic mine. h. Dragline operations. j. Copper-Gold mine. k. Power shovel or dry land dredge. m. Lead mine.

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GOLD—Continued

Principal gold producers in California out of a total of 1,777 placer operators and lode mines in 1939

Mine	Type of mine	Operator	Address	Postoffice of mine
Sierra County				
Colombo	a	W. G. Farrell	2629 Ashby Ave., Berkeley	Sierra City
Gold Point	a	Tombstone Development Co.	Downieville	Downieville
Kenton	a	Gamble & Wilson	Alleghany	Alleghany
Original 16 to 1	a	Original Sixteen to One Mine, Inc.	1611 Russ Bldg., San Francisco	Alleghany
Plumbago	a	Allied Mines, Inc.	P.O. Box 1098, Nevada City	Alleghany
Ruby	f	C. L. Best	Goodyears Bar	Goodyears Bar
Sierra Alaska	a	F. Gilman Lou	1608 Delaware St., Berkeley	Pike
Sierra Buttes	c	Sierra Buttes Tailing Co.	Sierra City	Sierra City
Three Kings (Irelan)	a	Ted Le Maire, et al.	66 Ritch St., San Francisco	Alleghany
Siskiyou County				
Buzzard Hill	a	Merriam Mining Merger	Happy Camp	Happy Camp
Cal Oro	e	Cal Oro Dredging Co.	681 Market St., San Francisco	Yreka
Humming Bug	a	Humming Bug Mines Co.	Yreka	Yreka
Joubert	g-f	Stanley Czerwinski, et al.	Sawyers Bar	Sawyers Bar
King Solomon	a	King Solomon Mines Co.	Monte Vista, Colorado	Black Bear
Quartz Hill	a	George C. Noonan	Scott Bar	Scott Bar
Reeves Ranch	h	Lincoln Gold Dredging Co.	Lincoln	Happy Camp
S. T. S.	g	J. F. Judge	Sawyers Bar	Sawyers Bar
Sacchi-Spellenberg	h	Sacchi-Spellenberg Mines	Arcata	Forks of Salmon
Scandia	h	Larsen Bros. & Harms Bros.	R.F.D. 4, Box 2220, Sacramento	Horse Creek
Siskiyou Unit	e	Yuba Consolidated Gold Fields	351 California St., San Francisco	Callahan
Tony Lund	k	Wm. Van der Hellen Mines	P.O. Box 158, Yreka	Yreka
Yreka Gold Dredge	e	Yreka Gold Dredging Co.	351 California St., San Francisco	Yreka
Stanislaus County				
California Gold Dredge	e	California Gold Dredging Co.	503 Balfour Bldg., San Francisco	Linden
Dredge No. 4	e	La Grange Gold Dredging Co.	1805 Mills Tower, San Francisco	La Grange
Placer Properties	h	Placer Properties Co.	Oakdale	Oakdale
Rand Gravel	k	Ernest Harker & L. R. Harris	La Grange	La Grange
Tuolumne Gold Dredge	e	Tuolumne Gold Dredging Corporation	La Grange	La Grange
Tehama County				
Bend	h	Midland Co.	733 Dwight Way, Berkeley	Red Bluff
Evans	h	Tehama Dredging Co.	Box 727, Anderson	Anderson
Trinity County				
Canyon Placers	g	Canyon Placers, Inc.	Junction City	Junction City
Carrville Dredge	e	Carrville Gold Co.	807 Lonsdale Bldg., Duluth, Minn.	Trinity Center
Enterprise	a	Enterprise Lease (Al Hanson)	Box 171, Weaverville	Weaverville
Filibuster Group	h	Viking Dredging Co.	P.O. Box 498, Chico	Weaverville

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General Utility	h	General Utility Corporation	505 Bank of America Bldg., Sacramento	Weaverville
Hayfork	h	Cinco Mineros Co.	P.O. Box 212, Oroville	Hayfork
Hayfork Dredge	h	Hayfork Gold Dredging Co.	Hayfork	Hayfork
Hazel D.	a	Johnston Bros.	51 N-E, Weidler St., Portland, Ore.	Denny
Interstate Dredge	h	Interstate Mines, Inc.	Box 498, Chico	Redding
Junction City	e	Junction City Mining Co.	685 6th St., San Francisco	Junction City
Leas & Lowden	h	Lincoln Gold Dredging Co.	Lincoln	Lewiston
Lewiston Dredge	e	Lewiston Gold Dredging Co.	960 Russ Bldg., San Francisco	Lewiston
Red Hill	g	Goldfield Consolidated Mines Co.	1225 Crocker Bldg., San Francisco	Junction City
Sourdough Group	h	Golden Gravel Mining Co.	Junction City	Junction City
Swanson	g	Swanson Mining Corporation	Salyer	Salyer
Trinity Dredge	e	C. R. & Thomas D. Harris	Lewiston	Lewiston
Weaver Dredge	h	Weaver Dredging Co.	Box 216, Weaverville	Weaverville
Weaverville	h	Oro Trinity Dredging Co.	Box 212, Oroville	Weaverville
Tuolumne County				
Baker Corporation	h	Baker Corporation	Chinese Camp	Chinese Camp
Curtis Creek, et al.	h	E. A. Kent	P.O. Box 391, Stockton	Sonora
Eagle Shawmut	a	Eagle Shawmut (D. C. Peacock, Agent)	Chinese Camp	Chinese Camp
Erin-Go-Brah	a	Del Gold Corporation	Jamestown	Jamestown
Heslop-App-Sweeney	a	Allied Mines, Inc., et al.	Jamestown	Jamestown
Moccasin	h	Moccasin Mines	R.F.D. 4, Box 2220, Sacramento	Moccasin
Ryan	a	N. A. Anderson	Twain Harte	Twain Harte
Yuba County				
Blue Point	f	Calmich Mining Co.	74 New Montgomery St., San Francisco	Smartville
Far West Dredge	h	Far West Dredging Co.	621 W. Acacia St., Stockton	Wheatland
Mt. De Oro	a	J. Raymond Evans & Mathis Herbst	Woodleaf	Woodleaf
Pennsylvania	a	Empire Star Mines Co., Ltd.	14 Wall St., New York, N. Y.	Browns Valley
Poverty Hill	g	A. J. Oyster	650 Russ Bldg., San Francisco	Strawberry Valley
Williams Bar Dredge	e	Williams Bar Dredging Co.	Hobart Bldg., San Francisco	Smartville
Yuba Unit	e	Yuba Consolidated Gold Fields	351 California St., San Francisco	Hammonton

a. Lode gold mine. b. Gold-Silver mine. c. Tailings dumps. d. Pocket. e. Dredge (bucket line). f. Drift mine. g. Hydraulic mine. h. Dragline operations. j. Copper-Gold mine. k. Power shovel or dry land dredge. m. Lead mine.

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GRANITE

Operator	Product	Address	Location of quarry
Fresno County			
Superior-Academy Granite Co.	a	Clovis	Academy
Los Angeles County			
Binder Bros., W. H. Binder	d	285 N. Lake Ave., Pasadena	Bouquet Canyon
Madera County			
Madera Quarries Co.	a	Box 156, Madera	Bates Station
Mariposa County			
Yosemite National Park	a	Yosemite	Yosemite Park
Nevada County			
Netz Granite Quarry, Ludwig Netz	a	Nevada City	Nevada City
Placer County			
Victor Wickman	a	Rocklin	Rocklin
Plumas County			
Paul Sonognini	a	Chilcoot	Chilcoot
Riverside County			
Emil Johnson	a, e	Perris	Perris
Sacramento County			
Folsom State Prison	a, e	Represa	Represa
San Bernardino County			
Texas Quarries, Inc., R. M. Richter	a	Box 91, Austin, Texas	Victorville
San Diego County			
Crystal Black Quarry, John Stridsburg	a	Escondido	Spooks Canyon
Pacific Cut Stone & Granite Co.	a	414 S. Marengo Ave., Alhambra	Escondido
Shasta County			
Lassen Volcanic National Park	a	Mineral via Red Bluff	Lassen Volcanic National Park
Sonoma County			
S. Cabrol	b, c	Glen Ellen	Glen Ellen
Ernest Laurent	b, c	Kenwood	Kenwood
Ventura County			
Ritchie Bros., R. A. Ritchie and J. A. Ritchie	a	Fillmore	Grimes Canyon

a. Granite used in building and monumental stone. b. Tuff used as building stone. c. Volcanic rock used as flagstone and building stone. d. Mica schist used as building stone. e. Paving blocks.

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Operator	Address	Location of quarry
Alameda County		
Westvaco Chlorine Prod. Corp.*	Newark	Newark
Fresno County		
Dos Palos Gypsum Co., O. L. Divens and A. A. Conrowe	Dos Palos	Dos Palos
Green & Collins	Ceres	South Dos Palos
Paoli Gypsum Mine, A. P. Shepard, Mgr.	3101 Mariposa St., Fresno	Mendota
Imperial County		
Imperial Gypsum Quarry, Pacific Portland Cement	111 Sutter St., San Francisco	Plaster City
Kern County		
H. M. Holloway	Box 310, Lost Hills	Lost Hills
Jim's Gypsum Pit, De Barte & Bohns	Box 203, Lost Hills	Lost Hills
Valley Agricultural Gypsum	Box 186, Shafter	Lost Hills
Monterey County		
Triangle Fertilizer Co.	Salinas	King City
Riverside County		
U. S. Gypsum Co.	507 Architects Bldg., Los Angeles	Midland

*** Output not included in production figures as gypsum is byproduct of chemical process using minerals already included in State total.**

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IODINE

Operator	Address	Mine
Los Angeles County		
Deepwater Chemical Co., Ltd	Box 588, Compton	Compton
The Dow Chemical Co	Midland, Mich	Long Beach and Venice

IRON

Operator	Address	Location of mine
Inyo County		
L. S. McGirk	Shoshone	Shoshone
San Bernardino County		
Cave Canyon Iron Mine, A. S. Vinnell Co	1100 Westminster Ave., Alhambra	Baxter
Santa Cruz County		
Coast Metals & Reduction Co	Rob-Roy, c/o Watsonville	Aptos

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Principal lead producers in California in 1939

Mine	Operator	Address	Postoffice of mine
Inyo County			
Gold Bottom	Gold Bottom Mines, Inc.	P.O. Box 1556, Bakersfield	Trona
Golden Treasure	H. Ashford, et al.	Shoshone	Shoshone
Montezuma	Louis Cantua	Bigpine	Bigpine
----------	Jack Greaves	Olancha	Olancha
Mariposa County			
Bondurant	Bondurant Mg. & Mg. Co.	405 Montgomery St., San Francisco	Coulterville
Mono County			
Green Monster	Molini Bros.	Dyer	Dyer
Nevada County			
Empire Star Group	Empire Star Mines Co., Ltd.	14 Wall St., New York City, N. Y.	Grass Valley
Lava Cap	Lava Cap Gold Mining Corporation	Box 780, Nevada City	Nevada City
Spanish	Bradley Mining Co.	922 Crocker Bldg., San Francisco	Washington
Orange County			
Silverado (Blue Light)	Blue Light Silver Mines, Inc.	Fullerton	Fullerton
Placer County			
Alabama	Alabama California Gold Mines Co.	Box 155, Auburn	Penryn
Plumas County			
Morning Star & Trenton Group	E. C. Robinson	629 Edison Bldg., Los Angeles	Berry Creek
Riverside County			
Black Eagle	Imperial Smelting & Refining Co.	811 W. 7th St., Los Angeles	Indio
San Bernardino County			
Carbonate	P. J. Hillwig	Oro Grande	Oro Grande
Forty Nine	J. A. Fredrickson, et al.	Cima	Cima

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Operator	Product	Address	Location of quarry
Alameda County			
Westvaco Chlorine Prod. Corp.	a, d	Newark	Newark
El Dorado County			
Auburn Chemical Lime Co., Ltd.	a, b	Auburn	Newcastle
Diamond Springs Lime Co.	a, b, c	Diamond Springs	Diamond Springs
El Dorado Limestone Co., J. H. Bell, Pres.	b	Shingle Springs	Shingle Springs
Pac. Portland Cement Co., Cons.	b	111 Sutter St., San Francisco	Auburn
Fresno County			
Mt. Campbell Lime Co., R. C. Finck, Mgr.	c, e	Dinuba	Reedley
Imperial County			
Tycrete Chemical Corp.	b	Chula Vista	Chula Vista
Inyo County			
Blue Star Talc Mine, Ltd.	a, b	840 S. San Julian St., Los Angeles	Zurich
Los Angeles County			
W. F. Glasser, Inc.	b	713 N. Sepulveda, Brentwood Heights, Los Angeles	
Riverside County			
Howard Small	b	311 Main St., Riverside	Riverside
San Bernardino County			
Cal. Portland Cement Co.	a	601 W. 5th St., Los Angeles	Colton
Chubbuck Lime Co., Chas. I. Chubbuck	a, b, c	500 Worth St., Los Angeles	Chubbuck
Victorville Lime Rock Co.	b	2424 Enterprise St., Los Angeles	Victorville
San Luis Obispo County			
Charles Taylor	b	Salinas	Cambria
San Mateo County			
Pacific Portland Cement Co.	c, d	111 Sutter St., San Francisco	Redwood City
Santa Clara County			
Bay Shell Co.	c, d	503 Market St., San Francisco	Alviso
L. H. Beck	c, d	Box 113, Colma	Alviso
W. B. Ortley Shell Co.	d	Alviso	Alviso
Santa Cruz County			
Henry Cowell Lime and Cement Co.	a, b	2 Market St., San Francisco	Santa Cruz
Pacific Limestone Prod. Co.	b	Spring St., Santa Cruz	Santa Cruz
Santa Cruz Portland Cement Co.	b	Crocker Bldg., San Francisco	Davenport
Tuolumne County			
McLean Quarry, W. S. McLeans	a	419 Bayshore Blvd., San Francisco	Columbia
U. S. Lime Products Corp.	a, b	58 Sutter St., San Francisco	Sonora

a. Producer of burnt lime. b. Producer of limestone. c. Agricultural lime. d. Shells. e. Marl.

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LITHIA

Operator	Address	Location of mine
American Potash & Chemical Corp.	Trona	Trona

MAGNESITE

Operator	Address	Location of mine
Santa Clara County		
Westvaco Chlorine Prod. Corp., Lessee, Western Magnesite Mine	Newark	Red Mountain
Stanislaus County		
Westvaco Chlorine Prod. Corp., Lessee, Bald Eagle Mine	Newark	Gustine

MAGNESIUM SALTS

Operator	Product	Address	Location of plant
Alameda County			
Westvaco Chlorine Prod. Corp.	Hydroxide	Newark	Newark
San Diego County			
Westvaco Chlorine Prod. Corp.	Chloride	Newark	San Diego
San Mateo County			
Marine Chemical Co., R. E. Clarke	Carbonate hydroxide and oxide	South San Francisco	South San Francisco
Plant Rubber & Asbestos Works	Carbonate	537 Brannan St., San Francisco	Redwood City

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MANGANESE ORE

Operator	Address	Location of mine
Pacific Coast Manganese Corp.	214 Bank of America Bldg., Beverly Hills	Midway well

MARBLE (Including Onyx and Travertine)

Operator	Product	Address	Location of quarry
Inyo County			
Inyo Marble Co.	a	726-732 E. 29th St., Los Angeles	Lone Pine
San Bernardino County			
Vaughan Marble Quarry, Arthur C. Vaughan, Pres.	a	990 Magnolia Ave., Los Angeles	Cadiz
San Luis Obispo County			
Reynolds Quarry, Thomas C. Reynolds	b	Box 53, Paso Robles	Paso Robles
Santa Barbara County			
G. Antolini	b	111 E. Gutierrez St., Santa Barbara	Tijguas
Solano County			
United Quarries, Inc.	c	445 Bayshore Blvd., San Francisco	Cement
Tuolumne County			
Columbia Marble, Inc.	a	85 2d St., San Francisco	Columbia

a. Marble. b. Limestone, building and flagstone. c. Onyx and travertine.

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Operator	Address	Location of spring
Butte County		
Richardson Mineral Springs, Lee Richardson, Mgr.	Richardson Springs	Richardson Springs
Calaveras County		
Mok-Hill Mineral Springs, Cavanaugh & Pierovich	Jackson	Mokelumne Hill
Contra Costa County		
Alhambra Water Co.	Martinez	Martinez
Fox Water Co.	675 37th St., Oakland	Oak Springs
El Dorado County		
Digger Indian Natural Medicine Water Co.	Randall P.O.	Randall
Fresno County		
Mercey Mineral Springs Co., F. J. Bourn, Pres.	Dos Palos	Dos Palos
Lake County		
Adams Mineral Springs, Clarence Prather	Adams, via Middletown	Adams
Bartlett Springs Co., J. H. Heller, Sec'y	1663 32d Ave., San Francisco	Bartlett Springs
Howaid Hot Springs, J. P. Francisco	Middletown	Middletown
Norman Mineral Springs, H. C. Norman, Mgr.	Middletown	Middletown
Witter Medical Springs, W. E. Whitaker	995 Market St., San Francisco	Witter Springs
Los Angeles County		
Cascade Water Co.	4556 York Blvd., Los Angeles	Los Angeles
Deep Rock Artesian Water	4416 York Blvd., Los Angeles	Los Angeles
Elysian Spring Water Co.	1536 Baxter, Los Angeles	Los Angeles
Frespuro Artesian Water	4430 York Blvd., Los Angeles	Los Angeles
Holly Spring Water	2298 Holly Dr., Los Angeles	Los Angeles
Magnetic Spring Water Co.	936 Palm Ave., Sherman	Los Angeles
Mission Spring Water Co.	8938 Keith, Hollywood	Hollywood
Mountain Spring Water Co.	226 S. Avenue 54, Los Angeles	Los Angeles
Pure-lax Mineral Water Co.	3640 Griffin, Los Angeles	Los Angeles
Sparklett Bottled Water Co.	4500 York Blvd., Los Angeles	Los Angeles
Marin County		
Purity Spring Water Co.	2032 Kearny St., San Francisco	
Modoc County		
Surprise Valley Mineral Wells, Simon Bennett	Cedarville	Cedarville

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MINERAL WATER—Continued

Operator	Address	Location of spring
Napa County		
Calistoga Bottling Works, Louis Martinelli	Calistoga	Calistoga
Napa Soda Springs Co., G. H. T. Jackson	315 Montgomery St., San Francisco	Napa
Napa Vichy Springs, V. Frugoli	225 Bay St., San Francisco	Napa
Samuels Soda Springs, Mrs. Robert J. Little	Monticello	Monticello
Placer County		
Kilaga Water Co	Lincoln	Valley
Riverside County		
Beulah Springs, Oscar C. McNicholl	Arlington	Arlington
San Bernardino County		
Arrowhead Hot Springs, Calif. Cons. Water Co	1566 E. Washington Blvd., Los Angeles	Arrowhead
San Diego County		
Cuyamaca Mineral Water, San Diego Ice & Cold Storage Co	67 8th St., San Diego	San Diego
Crystaloma Mt. Spring Water, C. E. Merritt	Ramona	Ramona
Rock Springs Co., E. S. Walck	R.F.D. 2, Box 442, Escondido	Escondido
San Francisco County		
Blue Crest Beverage Co., Morris & Paul Greenberg	265 Naples St., San Francisco	San Francisco
Diamond Rock Spring Water Co., L. Paolinelli	247 Naples St., San Francisco	San Francisco
San Luis Obispo		
Crystal Spring Water Co., W. R. Hudson	R.F.D. 2, Box 11, San Luis Obispo	San Luis Obispo
Santa Barbara County		
Veronica Mineral Springs Co	699 Brannan St., San Francisco	Santa Barbara
Siskiyou County		
Coca Cola Bottling Co., Fred J. Meamber, Prop	Yreka	Little Shasta
The Shasta Water Co	6th and Brannan Sts., San Francisco	Dunsmuir
Sonoma County		
Agua Caliente Springs Co., T. H. Corcoran, Prop	Agua Caliente	Agua Caliente
Barcal Springs, John Kolling	Preston	Preston
Boyes Springs Mineral Water Co	Boyes Springs	Boyes Springs
Fetters Mineral Springs, George Fetters	Fetters Springs	Fetters Springs

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MOLYBDENUM ORE

Mine	Operator	Address	Location of mine
Pine Creek Mine	United States Vanadium Corp.	Bishop	Bishop

PLATINUM

Principal Platinum Producers in California in 1939

Operator	Address	Location of mine
Amador County		
Gold Hill Dredging Co.	351 California St., San Francisco	Camanche
Butte County		
Oroville Gold Dredging Co.	Oroville Inn, Oroville	Oroville
Yuba Cons. Goldfields Co.*	351 California St., San Francisco	Rio Bonito
Merced County		
Yuba Consolidated Gold Fields*	351 California St., San Francisco	Snelling
Placer County		
Gold Hill Dredging Co.	311 California St., San Francisco	Loomis
Midland Co.	733 Dwight Way, Berkeley	Lincoln
Sacramento County		
Capital Dredging Co.*	Balfour Bldg., San Francisco	Folsom
Cosumnes Gold Dredging Co.	351 California St., San Francisco	Sloughhouse
Natomas Co.*	Forum Bldg., Sacramento	Natomas
Stanislaus County		
California Gold Dredging Co.	351 California St., San Francisco	Jenny Lind
Shasta County		
Roaring River Gold Dredging Co.	351 California St., San Francisco	Cottonwood
Tehama County		
The Midland Co.	733 Dwight Way, Berkeley	Red Bluff
Tehama Dredging Co.	Box 727, Anderson	Bend
Trinity County		
Junction City Mining Co.	Junction City	Junction City
Swanson Mining Corp.	Salyer	Salyer
Yuba County		
Yuba Consolidated Gold Fields*	351 California St., San Francisco	Hammonton

*** Platinum metals not sold in 1939.**

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POTASH

Operator	Address	Location of plant
San Bernardino County		
American Potash and Chemical Co.	Trona	Trona

PUMICE OR VOLCANIC ASH

Operator	Product	Address	Location of quarry
Amador County			
Industrial Minerals & Chemical Co.	b	836 Gilman St., Berkeley	Edwin
Inyo County			
Chas. Brown	a	Shoshone	Shoshone
Little Lake Pumice Co.	a	1204 S. Monterey St., Alhambra	Coso Junction
California Pumice Co.	a	13539 Hart Ave., Van Nuys	Brown
Kern County			
Calsilico Corp., G. A. Reynolds	b	920 N. Humphreys Ave., Los Angeles	Cantil
Cudahy Packing Co.	b	803 Macy St., Los Angeles	Ceneda
Madera County			
Calif. Industrial Minerals	b	c/o Forrest S. Taylor, Friant	Friant
Elmer Erickson	a	Friant	Friant
Modoc County			
H. W. Free	a	156 Spring St., Klamath Falls, Ore.	Tionesta
Mono County			
Alexander Jamieson	d	Box 20, Big Pine	Big Pine
Pumice Product Co.*	a	260 California St., San Francisco	Benton
Napa County			
Basalt Rock Co.	a	8th St., Napa	Monticello
C. Cicero	a	Box 446, Napa	Monticello
San Luis Obispo County			
Red Eagle Mine, M. L. Francis	b	Creston	Creston
Siskiyou County			
Ray N. Fouch	a, d	328 Liberty St., Ashland, Ore.	Glass Mountain
H. W. Free	a, c, d	156 Spring St., Klamath Falls, Ore.	Glass Mt.
Klamath Concrete Pipe Co.	a	Klamath Falls, Ore.	Glass Mt.

a. Pumice, aggregate. b. Volcanic ash. c. Scoria. d. Pumice for scouring brick.
* Out of business in 1939.

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PYRITE

Operator	Address	Location of mine
Shasta County		
Mountain Copper Co., Wm. F. Kett, Mgr.	351 California St., San Francisco	Matheson

QUICKSILVER

Principal Producers in California for 1939, out of a Total of 78 Operating Properties

Mine	Operator	Address	Post Office of mine
Contra Costa County			
Mt. Diablo	Bradley Mining Co.	Crocker Bldg., San Francisco	Clayton
Fresno County			
Archer	Joseph Byles & Sons	Coalinga	Coalinga
Inyo County			
Coso Hot Spring	A. W. Leege	2233 Anacapa St., Santa Barbara	Little Lake
Kern County			
Cuddeback	Walabu Mining Co.	Box 1168, Bakersfield	Keene
Kings County			
Kings	Bert Harvey	Parkfield	Parkfield
Lake County			
Bullion	Harold Smith	1427 Kearney St., St. Helena	Middletown
Great Western	Bradley Mining Co.	Crocker Bldg., San Francisco	Middletown
Mirabel	Mirabel Quicksilver Co.	Middletown	Middletown
Sulphur Bank	Bradley Mining Co.	Crocker Bldg., San Francisco	Lower Lake

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QUICKSILVER—Continued

Principal Producers in California for 1939, out of a Total of 78 Operating Properties

Mine	Operator	Address	Post Office of mine
Napa County			
Aetna	J. F. Knapp	1401 Park Ave., Oakland	Aetna Springs
La Joya	F. A. Bachech	Oakville	Oakville
Manhattan Mine	Chas. Wilson & W. M. Hickox	Monticello	Monticello
Oat Hill	Oat Hill Mine, Inc.	10 Penthouse, Mills Bldg., San Francisco	Aetna Springs
Oat Hill Extension	Zack Anderson	Middletown	Aetna Springs
San Benito County			
Aurora	San Benito Quicksilver Mining Co., K. R. Nutting	Box 728, Salinas	Idria
New Idria	New Idria Quicksilver Mining Co.	Mills Bldg., San Francisco	Idria
Stayton Quicksilver Mine	R. B. Knox	Hollister	Hollister
Wonder	Paul Gonzales	Idria	Idria
San Luis Obispo			
Deer Trail	Pedro Ferrel	211 E. Mill St., Santa Maria	Huasna
Klau	Klau Mine, Inc.	Mills Bldg., San Francisco	Adelaide
La Libertad	Oscar & Howard Mining Co., Howard Tripp	Paso Robles	Adelaide
Santa Barbara County			
Lions Den	Jesse G. Moore, Pedro Farrel & Chas. Wood	Box 127, Los Olivos	Los Olivos
Los Prietos	T. H. Canfield	Box 277, Santa Barbara	Santa Barbara
Santa Clara County			
Guadalupe Mine	Laco Mining Co., H. N. Mason	R.F.D. 3, Box 412, Los Gatos	Los Gatos
New Almaden	Quicksilver Mining Co., P. R. Schneider	Los Gatos	Almaden
Sonoma County			
Contact	Contact Mining Co.	Bank of America Bldg., Santa Rosa	Pine Flat
Culver Bear	C. A. Baumester	Cloverdale	Cloverdale

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Operator	Address	Location of plant
Alameda County		
American Salt Co., Mrs. Mary Marsicano	2970 Lake St., San Francisco	Mt. Eden
Leslie Salt Co.	310 Sansome St., San Francisco	Newark and Mt. Eden
Oliver Brns. Salt Co.	Mt. Eden	Mt. Eden
Butte County		
Richardson Mineral Springs, Lee Richardson, Mgr.	Richardson Springs	Richardson Springs
Imperial County		
Imperial Salt Co	4000 E. Washington Blvd., Los Angeles	Calipatria
Kern County		
Long Beach Salt Co.	P.O. Box 28, Long Beach	Saltdale
Los Angeles County		
Long Beach Salt Co.	P.O. Box 28, Long Beach	Long Beach
Modoc County		
Surprise Valley Salt Works, Joshua H. Hutchinson	Box 26, Cedarville	Lake City
Mono County		
C. C. Miller	837 W. Los Angeles St., Baldwin Park	Mono Lake
Monterey County		
Monterey Bay Salt Co., E. C. Vierra, Mgr.	Moss Landing	Moss Landing
Orange County		
The Irvine Co.	Tustin	Tustin
San Bernardino County		
California Rock-Salt Co.	2465 Hunter St., Los Angeles	Amboy
Rock Salt Products Co.	845 El Centro St., South Pasadena	Salt Marsh
San Diego County		
Western Salt Co.	1245 National Ave., San Diego	San Diego
San Mateo County		
Stauffer Chemical Co.	636 California St., San Francisco	Redwood City

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SANDSTONE

Operator	Address	Location of quarry
Los Angeles County		
W. F. Glasser, Inc.	713 N. Sepulveda, Brentwood Heights, Los Angeles	Brentwood Heights
Monterey County		
Carmel Stone Quarry, A. L. Possadori	Carmel	Carmel
Sierra Quarry, H. E. Rogers	Box 136, Carmel	Carmel
Andrew Stewart	Carmel Valley	Carmel Valley
Napa County		
H. F. Galbreath	1668 Lincoln St., Berkeley	
Shasta County		
H. F. Galbreath	1668 Lincoln St., Berkeley	Ono

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SILICA

Operator	Product	Address	Location of mine
Contra Costa County			
Hazel-Atlas Glass Co. of California, Ltd.	b	89th and G St., Oakland	Summerville
Silica Co. of California, Ltd.	b	Brentwood	Brentwood
Orange County			
Arnold Clay Mine, I. P. Arnold	b	1846 W. 83d St., Los Angeles	El Toro
Riverside County			
P. J. Weisel, Inc.	b	La Habra	Corona
San Bernardino County			
Temescal Clay Co.	c	5601 S. Boyle Ave., Los Angeles	Victorville
San Diego County			
Calavera Materials Co.	a	Oceanside	Oceanside

a. Quartz. b. Glass sand. c. Quartzite.

SILLIMANITE-ANDALUSITE-CYANITE GROUP

Operator	Product	Address	Location of mine
Imperial County			
Vitrefrax Co.	Cyanite	500 Pacific St., Vernon, Los Angeles	Ogilby
Mono County			
Champion Spark Plug Co., Ceramic Division	Andalusite	Butler Ave. and Grand Trunk R. R., Detroit, Mich.	Mocalno

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SILVER

Principal silver producers in California in 1939

Mine	Type of mine	Operator	Address	Postoffice of mine
Alpine County				
Zaca	b	Zaca Mining Corporation	558 Russ Bldg., San Francisco	Markleeville
Amador County				
Argonaut	a	Argonaut Mining Co., Ltd.	1404 Humboldt Bank Bldg., San Francisco	Jackson
Central Eureka & Old Eureka	a	Central Eureka Mining Co.	111 Sutter St., San Francisco	Sutter Creek
Delta Tailings Dump	h	Delta Tailings Co.	564 Market St., San Francisco	Ione
Calaveras County				
Carson Hill	a	Carson Hill Gold Mining Corporation	Melones	Melones
Mountain King	a	Jumbo Consolidated Mining Co.	Copperopolis	Copperopolis
El Dorado County				
Alhambra	a	Alhambra-Shumway Mines, Inc.	Kelsey	Kelsey
Big Canyon	a	The Mountain Copper Co.	351 California St., San Francisco	Shingle
Eldorado Crystal	a	Eldorado Crystal Mine	Shingle	Shingle
Imperial County				
Cargo Muchacho	a	Holmes & Nicholson Mg. & Mg. Co.	Box 451, Winterhaven	Ogilby
Inyo County				
Del Norte	a	Louis Marklewitz, et al.	Mojave	Mojave
Pine Creek	c	U. S. Vanadium Corporaton	Laws	Laws
Reward (Brown Monster)	a	T. L. Bright, et al.	Bigpine	Independence
----------	c	Jack Greaves	Olancha	Olancha
Kern County				
Big Blue-Lady Belle	a	Kern Mines, Inc.	Kernville	Kernville
Cactus Queen	d	Cactus Mines Co.	Rosamond	Rosamond
Fairview	a	E. W. Little, et al.	Rosamond	Rosamond
Four Jacks	d	Eric Fallen, et al.	Rosamond	Rosamond
Four Star	a	Pride of Mojave Mg. Corporaton	Mojave	Mojave
Golden Queen	a	Golden Queen Mining Co.	Mojave	Mojave
Karma	b	E. L. Wegman	Mojave	Mojave
Starlight (Lode Star)	a	Lode Star Mining Co.	Mojave	Mojave
Standard	a	A. J. Bruce	Mojave	Mojave
Tropico	a	Burton Bros., Inc.	Rosamond	Rosamond
Yellow Aster	a	Anglo-American Mining Corp., Inc.	Randsburg	Randsburg
Whitmore	d	Whitmore Mines, Inc.	405 S. Hill St., Los Angeles	Mojave
Mariposa County				
Bondurant	a	Bondurant Mg. & Mg. Co.	405 Montgomery St., San Francisco	Coulterville
Mount Gains	a	Mount Gains Mining Co.	Hornitos	Hornitos
Red Bank	a	Red Bank Mine (Fred W. Draper)	Bagby	Bagby

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Mono County				
Camanche	b	F. L. Main	Los Angeles	Bodie
Green Monster	b	Molini Bros.	Dyer	Dyer
Monte Christo	d	Monte Christo Co.	P.O. Box 134 Whittier	Mammoth Lake
Standard	d	Roseklip Mines Co.	206 Sansome St., San Francisco	Bodie
Napa County				
Grigsby (Palisades)	d	Graham & Loftus Oil Corporation	811 W. 7th St., Los Angeles	Calistoga
Nevada County				
Empire Star Group	a	Empire Star Mines Co., Ltd.	14 Wall St., New York City, N. Y.	Grass Valley
Golden Center	a	Cooley Butler	745 Rowan Bldg., Los Angeles	Grass Valley
Idaho Maryland	a	Idaho Maryland Mines Corporation	Russ Bldg., San Francisco	Grass Valley
Lava Cap	a	Lava Cap Gold Mining Corporation	Box 780, Nevada City	Nevada City
Spanish	a	Bradley Mining Co.	922 Crocker Bldg., San Francisco	Washington
Orange County				
Silverado (Blue Light)	a	Blue Light Silver Mines, Inc.	Fullerton	Fullerton
Placer County				
Alabama	a	Alabama California Gold Mines Co.	Box 155, Auburn	Penryn
Oro Fino	a	Oro Fino Consolidated Mines	Box V, Auburn	Auburn
Plumas County				
Ohio Point	a	Virgilia Mining Corporation	Virgilia	Virgilia
Walker	j	Walker Mining Co.	821 Kearns Bldg., Salt Lake City	Walkermine
Riverside County				
Black Eagle	a	Imperial Smelting & Refining Co.	811 W. 7th St., Los Angeles	Indio
Sacramento County				
Natomas	e	Natomas Company	Box 1197, Sacramento	Natoma
San Bernardino County				
Carlyle	a	Camco Mining Co.	3715 W. 27th St., Los Angeles	Twentynine Palms
Gold Crown	a	Gold Crown Mining Co., Ltd.	714 W. Olympic Blvd., Los Angeles	Twentynine Palms
Kelly	d	F. W. Royer, et al.	Red Mountain	Red Mountain
Stonewall Jackson	b	M A. Kiwisar & Peter McCabe	Jean, Nevada	Jean, Nevada
Zenda	h	Lawrence Coke	Box 47, Yermo	Yermo
Shasta County				
Iron Mountain	a	The Mountain Copper Co., Ltd.	351 California St., San Francisco	Matheson
Sierra County				
Original 16 to 1	a	Original Sixteen to One Mine, Inc.	1611 Russ Bldg., San Francisco	Alleghany
Yuba County				
Pennsylvania	a	Empire Star Mines Co., Ltd.	14 Wall St., New York, N. Y.	Browns Valley

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SLATE

Operator	Product	Address	Location of quarry
El Dorado County			
Pacific Minerals Co., Ltd.	b	337 10th St., Richmond	Chili Bar
Los Angeles County			
Blue Goose Quarry, Robert Cox	c	1975 Lundy Ave., Pasadena	Pasadena
Tuolumne County			
W. S. McLean Estate, Inc.	b	419 Bayshore Blvd., San Francisco	Hetch Hetchy

. Roofing. b. Granules. c. Flagging.

SOAPSTONE AND TALC

Operator	Product	Address	Location of mine
Butte County			
McLean Talc Deposit, W. S. McLean Est.	a	419 Bayshore Blvd., San Francisco	McLean Spur
El Dorado County			
Jim Bernett	a	Shingle	Shingle
Industrial Minerals & Chemical Co.	a	836 Gilman St., Berkeley	Latrobe
Pacific Minerals Co., Ltd., Chas. S. Renwick, Jr.	a	337 10th St., Richmond	Shrub
Inyo County			
Blue Star Talc Mine, Ltd.	b	840 S. San Julian St., Los Angeles	Zurich
Sierra Talc Co., Franklin Booth, Mgr.	b	428 Union League Bldg., Los Angeles	Keeler
Los Angeles County			
Binder Bros., W. H. Binder	a	285 N. Lake Ave., Pasadena	Bouquet Canyon
San Bernardino County			
Pacific Coast Talc Co.	b	2149 Bay St., Los Angeles	Silver Lake
Southern Calif. Minerals Co., W. S. Skeoch	b	320 Mission Rd., Los Angeles	Kingston Mt.
Western Talc Co.	b	1901 E. Slauson Ave., Los Angeles	Death Valley

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SODA

Operator	Product	Address	Location of plant
Inyo County			
Natural Soda Products Co.	a, b, d	405 Montgomery St., San Francisco	Keeler
Pacific Alkali Co.	a	1206 Pacific Mutual Bldg., Los Angeles	Bartlett
San Bernardino County			
American Potash & Chemical Co.	a, c	Trona	Trona
West End Chemical Co.	a	Latham Square Bldg., Oakland	West End

a. Soda Ash. b. Sodium Bicarbonate. c. Salt Cake. d. Trona.

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STONE, MISCELLANEOUS

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

NOTE.—The California State Highway Commission, the various counties, U. S. Forest Service and U. S. Bureau of Public Roads produce both crushed rock and sand and gravel in various places in the State used in construction and maintenance of highways, but not specified in this listing.

Operator	Product	Address	Location of pit or quarry
Alameda County			
California Rock & Gravel Co.	a	500 Call Bldg., San Francisco	Livermore
Heafey-Moore Co., Leona Quarry	b	344 High St., Oakland	Oakland
Henry L. Kaiser Co.	a, b	1522 Latham Square Bldg., Oakland	Radum
Kemper Bros.	g	5998 Strabridge Ave., Hayward	Hayward
Langdon Molding Sand, J. H. Langdon	c	R.F.D., Box 89, Niles	Decoto
Leslie Salt Co.	b	310 Sansome St., San Francisco	
Red Shale Quarry, W. S. McLean	d	419 Bayshore Blvd., San Francisco	Arroyo Mocho
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Eliot and Niles
Alfred W. Petersen	a	Box 943, Livermore	Livermore
Thos. B. Russell Quarry, T. B. Russell	b	1192 Russell Way, Hayward	Hayward
San Leandro Rock Co., Lake Chabot Quarry	b	2485 Washington St., San Leandro	Lake Chabot
Southern Pacific R.R. Co., Asst. Chief Engineer	a, b	Southern Pacific Bldg., San Francisco	Eliot, Niles, Radum
Superior Rock Co.	b	Broadway and McAdams St., Oakland	Oakland
Amador County			
Charles Ayers	a	Jackson	Jackson
Butte County			
Bechtel-Kaiser Rock Co., R. J. Kennedy, Mgr.	a, b	Oroville	Oroville
Dry Creek Sand & Gravel Plant, F. W. Donner	a	Chico	Cherokee Flat
J. E. Johnson Rock Co.	b	Weber Ave. and E St., Stockton	Chico
McLean's Quarry, W. S. McLean	d	419 Bayshore Blvd., San Francisco	McLean Spur
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Oroville
Calaveras County			
R. Nielsen	a	San Andreas	San Andreas
Pacific Minerals Co., Ltd.	d	337 10th St., Richmond	Angels
Contra Costa County			
Antioch Asphalt Sand Co.	a	2008 Mission St., San Francisco	Antioch
Basalt Rock Co.	a	8th St., Napa	Antioch
Blake Bros. Co., Anson Blake	b	204 Balboa Bldg., San Francisco	Point Richmond
Hutchinson Co., Stege Quarry	b	329 17th St., Oakland	Stege
Henry J. Kayser Co.	a	1522 Latham Square Bldg., Oakland	Newlove
Silica Co. of Calif., Ltd.	c	Brentwood	Brentwood
Southern Pacific R.R. Co., Asst. Chief Engineer	a	Southern Pacific Bldg., San Francisco	Newlove
E. Stamm	a	Antioch	Antioch
El Dorado County			
Diamond Springs Lime Co.	b	Diamond Springs	Diamond Springs

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Fresno County			
Central Rock & Sand Co.	a, b	Sanger	Sanger
Central Valley Const. Co.	a	Blackstone & Indianapolis, Fresno	Fresno
Grant-Pacific Rock Co.	a, b	Box 656, Fresno	El Prado
Southern California Edison	a	Edison Bldg., Los Angeles	----------
Stewart & Nuss	a, b	410 Thorne St., Fresno	Herndon
Vierwinder & Son	a	1746 Hammond St., Fresno	Fresno
Glenn County			
E. B. Bishop	a	Box 325, Orland	Wyo
Southern Pacific Co.	a	65 Market St., San Francisco	Wyo
Humboldt County			
D. A. Boyd	a	R.F.D., Arcata	Arcata
Mercer Fraser Co.	a	2d and Commercial St., Eureka	Essex and Fernbridge
Imperial County			
R. M. Albee	a	R.F.D. 2, Box 75, Brawley	Holtville
Brawley Concrete Co.	a	Brawley	Brawley
Imperial Rock Corp.	a	3232 E. 50th St., Vernon, Los Angeles	Niland
Nixon Pipe Yard	a	Seeley	Seeley
R. T. Pinner	a	Brawley	Brawley
W. M. Winn	a	El Centro	El Centro
Inyo County			
Beacon Transport Co., Guy Alexander	a, b	Box 726, Bishop	Bishop
Inyo Marble Co.	a	726-732 E. 29th St., Los Angeles	Lone Pine
Kern County			
Bakersfield Rock and Gravel Co.	a, b	Box 395, Station A, Bakersfield	Bakersfield
C. W. Hartman	a	W. Oak St., Bakersfield	Bakersfield
Kern Rock Co., Ltd.	a, b	Box 1697, Bakersfield	Kern River
Lassen County			
Red River Lumber Co.	b	Westwood	Westwood
Los Angeles County			
Arrow Rock Co.	a	Box 155, Monrovia	Monrovia
A. T. & S. F. R.R., I. L. Hibbard, Gen. Mgr.	a	609 Kerckhoff Bldg., Los Angeles	Forbes
Azusa Rock & Sand Co.	a, b	R.F.D., Azusa	Azusa
Richard R. Ball	a	Box 96, Walteria	Walteria
Blue Diamond Corp., Ltd.	a	1650 S. Alameda St., Los Angeles	El Monte and Roscoe
Wm. J. Bonfield	g	2008 Laurel Canyon Rd., Los Angeles	Hollywood
Chandler Palos Verdes S. & G., L. Chandler	a, b	Lomita	Lomita
City Rock Co.	a, b	Box A, Sunland	Sunland

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

* Consolidated July 1, 1938 to form Grant-Pacific Rock Co.

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STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
Los Angeles—Continued			
Consolidated Rock Products Co.	a, b	2730 S. Alameda St., Los Angeles	Whittier andFullerton
Ducey & Atwood Rock Co., R. K. Atwood, Pres.	a, b	Box 194, East Pasadena	East Pasadena
Eastside Building Materials Co.	a	8830 Santa Monica Blvd., Los Angeles	
Eaton Canyon Rock & Sand Co.	a, b	Box 95, East Pasadena	East Pasadena
W. F. Glasser, Inc.	b	713 N. Sepulveda, Brentwood Heights, Los Angeles	Brentwood Heights
Graham Bros.	a, b	3245 Fowler Ave., Los Angeles	Catalina Island and Roscoe
Granite Material Co.	g	8200 Tujunga Ave., No. Hollywood	Roscoe
John D. Gregg	a, b	Box 110, Whittier	Whittier
Lindauer Corp.	a	Box 208, La Habra	La Habra
Los Angeles Decomposed Granite Co.	g	2171 W. Washington, Los Angeles	Los Angeles
Manning Bros. Rock & Sand Co.	a, b	Irwindale	Irwindale
Moe Bros.	g	8170 Lauremont Dr., Hollywood	Laurel Canyon
Owl Truck & Materials Co.	a	Box 509, Compton	Compton
Pacific Rock & Gravel Co.	a, b	800 Lane Mortgage Bldg., 208 W. 8th St., Los Angeles	
Reynolds Crushed Gravel	g	914 N. Humphreys Ave., Los Angeles	Los Angeles
Rohl-Connolly Co.	b	4351 Alhambra Ave., Los Angeles	Catalina Island
Edwin Sidebotham & Son, Inc., Sidebotham Sand Plant	a	McFarland and L Sts., Wilmington	Lomita
J. H. Weadle	a, b	Monrovia	Monrovia
Marin County			
Daniels Const. Co.	b	503 Market St., San Francisco	San Rafael
Hutchison Co.	b	329 17th St., Oakland	San Quentin
Marin Gravel Co.	a	Point Reyes	Point Reyes
Mariposa County			
Frank B. Marks & Sons	b	Newman	Yosemite
Yosemite National Park	a, b	Yosemite	Yosemite Nat'l Park
Merced County			
Bair Creek Sand & Gravel Co., J. W. Huffman	a	Merced	
Frank B. Marks & Sons	b	Newman	Los Banos
Clyde Jones	a	Winton	Winton
Service Trucking Co.	a	Gustine	Gustine
Modoc County			
Great Northern Railway, A. E. Knight, Supt.	e	Klamath Falls, Ore.	Mammoth
Southern Pacific R.R. Co., Att. Ass't Chief Engineer	b	Southern Pacific Bldg., San Francisco	Goose Lake

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Mono County			
Allison & Nielsen	a, b	Leevining	Leevining
Monterey County			
Del Monte Properties, C. S. Olmsted	a, c	Del Monte	Del Monte
M. J. Murphy	a	Monte Verde and 9th Sts., Carmel	Carmel
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Lapis and Prattco
S. Ruthven, Seaside Sand Pit	a	Seaside	Seaside
Southern Pacific Co.	a	65 Market St., San Francisco	Lapis
Tynan Lumber Co.	a	Salinas	Salinas
Napa County			
Basalt Rock Co.	b	8th St., Napa	Napa
Juarez Quarry, M. G. Reidenbach	b	Napa	Napa
Errington Quarry & Juarez Quarry, M. L. Reidenbach	b	Napa	Napa
Southern Pacific R.R. Co., Att. Ass't Chief Engineer	b	Southern Pacific Bldg., San Francisco	Rocktram
Thorsen Gravel Pit, Harry Thorsen	a	St. Helena	St. Helena
Nevada County			
D. T. Brown	a, b	Grass Valley	Grass Valley
Grass Valley Rock & Sand Co., D. T. Brown	a, b	Grass Valley	Grass Valley
Orange County			
E. M. Barris Sand & Gravel Co.	a	Newport Beach	Newport Beach
California Rock Co.	a, b	R.F.D., Orange	Orange
Consolidated Rock Products Co.	a, b	2730 S. Alameda St., Los Angeles	Fullerton and Orange
Foster Sand & Gravel Co., W. Commonwealth	a, g	Fullerton	Fullerton
Fowler Sand & Gravel Co.	a	1178 S. Flower St., Santa Ana	Santa Ana
B. A. Stoffel	a	Anaheim	Anaheim
Placer County			
Roseville Sand Co.	a	115 Jones St., Roseville	Roseville
A. Teichert & Son, Inc.	a	1846 37th St., Sacramento	No. Fork American River
Victor Wickman	b	Rocklin	Rocklin
Plumas County			
Western Pacific R.R. Co., E. W. Mason, Gen. Sup't.	b	Mills Bldg., San Francisco	
Riverside County			
A. T. & S. F. R.R. Co., I. L. Hibbard, Gen. Mgr.	b	609 Kerckhoff Bldg., Los Angeles	Corona
Concrete Rock & Sand Co.	a	899 La Cadena St., Colton	Colton
Kumpe-Hauser Corp., Ltd.	b	Box 757, Riverside	Bly Junction, Ormand Quarry
Kuster & Waterburg	a	Corona	Corona

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

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STONE, MISCELLANEOUS—Continued

Under the heading of 'miscellaneous stone' there are four divisions—crushed rock, grinding mill pebbles, paving blocks, and sand and gravel. Crushed rock includes crushed rock that is used in macadam, ballast and for concrete; also rock used for rubble and riprap.

Operator	Product	Address	Location of pit or quarry
Riverside County—Continued			
Fay Massey	a, b	Indio	Indio
City of Riverside	b	Riverside	Riverside
Rohl-Connolly Co., Ormond Quarry	b	4351 Valley Blvd., Los Angeles	Bly Junction
San Goronio Rock Co.	a	Banning	Banning
The Service Gravel Co., F. A. Braman	a	Box 309, Riverside	Riverside
P. J. Weisel, Industrial Sands	a, c	La Habra	Corona
Sacramento County			
Gilbert Adams	a	2611 25th St., Sacramento	Sacramento
Brighton Sand & Gravel Co.	a, b	P.O. Box 2604, Sacramento	Sacramento
Canon & Co.	c	Box 281, Sacramento	Ben Ali
Del Paso Rock & Gravel Co.	a, b	H St. Rd., Sacramento	Del Paso
Folsom State Prison	b	Represa	Represa
Mucke Sand & Gravel Co.	a, b	1433 57th St., Sacramento	Mayhew
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Fair Oaks, Mayhew and American River
Perkins Gravel Co.	a, b	Perkins	Perkins
Robert Powell & Co.	a	Box 815, Sacramento	American River
San Benito County			
Granite Rock Co.	b	Drawer M, Watsonville	Logan
Southern Pacific Co.	b	65 Market St., San Francisco	Logan
San Bernardino County			
A. T. & S. F. R.R.	a	600 Kerckhoff Bldg., Los Angeles	Gale
Consolidated Rock Products Co.	a, b	2730 S. Alameda St., Los Angeles	
Fourth Street Rock Crusher, A. O. Johnson	a	San Bernardino	San Bernardino
E. Padgett	a	Barstow	Barstow
Redlands Gravel Co.	a, b	Redlands	Redlands
San Bernardino Rock & Gravel Co.	a, b	Box 249, San Bernardino	San Bernardino
Triangle Rock & Gravel Co.	a, b	San Bernardino	San Bernardino
San Diego County			
Calaveras Materials Co.	b, d	Oceanside	Oceanside
Canyon Rock Co.	a, b	Box F, San Diego	San Diego
Caudell & Johnson	a	Mission Valley	Mission Valley
Crystal Silica Sand Co.	a	Oceanside	Oceanside
Daley Corp., Geo. Daley	a	4430 Boundary St., San Diego	San Diego
H. G. Fenton Material Co.	a	13th and Imperial Ave., San Diego	San Diego
Elvira M. Hubbard	c	406 W. Nutmeg St., San Diego	San Diego
Nelson & Sloan	b	Box 832, Chula Vista	Chula Vista
Oceanside Rock & Sand Co.	a	Carlsbad	Oceanside
W. A. Thompson	a	3521 Eugene Place, San Diego	San Diego

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San Francisco County			
Mission Quarry Co.	b	210 Balboa Bldg., San Francisco	San Francisco
San Joaquin County			
G. W. Bianchiani	a	Sargent Road, Lodi	Lodi
D. M. Dyer	a	527 E. Lodi Ave., Lodi	Lodi
Louis F. Flockhart	a	600 N. School St., Lodi	Lodi
L. Lorentzen	a	741 Third St., Petaluma	Lodi
Frank Marks & Sons	a	Newman	Tracy
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Riverbank
Santa Fe Sand and Gravel Co., W. A. Arlington		Box 271, Escalon	Escalon
Elmer J. Warner	a	1103 Sycamore, Stockton	Stockton
San Luis Obispo County			
Walter B. Roselip	a, b	615 Grand Ave., San Luis Obispo	San Luis Obispo
San Mateo County			
Canadas Quarry, M. F. Cunha	b	Main St., Half Moon Bay	Half Moon Bay
Golden West Quarry	b	Geneva & Santos Sts., San Francisco	Colma
Holy Cross Cemetery	b	Colma	Colma
Industrial Mineral Products, W. B. Vestal, Pres.	c	400 7th St., San Francisco	
Market Street Ry. Co., Daly's Quarry	b	58 Sutter St., San Francisco	Daly City
Santa Barbara County			
Gates Gravel Plant, Frank H. Gates	a	Santa Maria	Sisquoc
Santa Clara County			
Anderson Gravel Co.	a	Mountain View	Mountain View
Carroll Gravel Pit, R. D. Carroll	a	R.F.D. 14, Box 310A, San Jose	San Jose
Los Gatos Sand and Gravel Co.	a	Los Gatos	Los Gatos
Martin Bros.	a	R.F.D. 2, Box 205A, San Jose	San Jose
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Coyote and Campbell
Rhodes & Robinson, Stanford Quarry	b	Box 325, Palo Alto	Palo Alto
Southern Pacific Co.	a	65 Market St., San Francisco	Coyote
Sondgroth Bros.	a	Mountain View	Mountain View
Santa Cruz County			
Central Supply Co.	a	Box 524, Santa Cruz	Santa Cruz
Henry J. Kaiser Co.	a	1522 Latham Square Bldg., Oakland	Olympia
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Olympia
Pacific Limestone Products Co.	b	Santa Cruz	Santa Cruz
Shasta County			
Diestelhorst Gravel Plant, Chas. Diestelhorst	a, b	1040 Liberty St., Redding	Redding
Lassen Volcanic Nat'l Park, Superintendent	a, b	Mineral via Red Bluff	Lassen Nat'l Park
Southern Pacific R.R. Co., Asst. Chief Engineer	e	Southern Pacific Bldg., San Francisco	Kennett

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terazzo. e. Slag and volcanic cinder. f. Tube-mill pebbles. g. Decomposed granite.

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STONE, MISCELLANEOUS—Continued

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Operator	Product	Address	Location of pit or quarry
Sierra County			
Hemstreet & Bell	b	411 C St., Marysville	Downieville
Siskiyou County			
James Baker	a	Klamath Falls, Ore.	
King Solomon Mines Co.	f	Crocker Bldg., San Francisco	Black Bear
W. D. Miller Cons. Co.	a	Box 168, Klamath Falls, Ore.	Graham Siding
Southern Pacific R.R. Co., Asst. Chief Engineer	e	Southern Pacific Bldg., San Francisco	Kegg
A. Young	a	345 N. Main St., Yreka	Yreka
Solano County			
Hartley Sand & Gravel Co., J. J. Hartley, Prop.	a	Dixon	Dixon
J. M. Nelson, Cordelia Quarry	b	Cordelia	Cordelia
Sonoma County			
Basalt Rock Co.	a	8th St., Napa	Healdsburg
Grandi Co.	a	Petaluma	Petaluma
Northwest Materials Co.	a	Geyserville	Geyserville
Spaletta & Siri	a	Santa Rosa	Santa Rosa
Hein Bros. Basalt Rock Co., Mark Hein, Pres.	b	Petaluma	Petaluma
Stony Point Quarry, W. A. Wilson	b	Petaluma, Star Route	Stony Point
Stanislaus County			
Tony Francisco	a	Crows Landing	Crows Landing
W. Haslan	a	Oakdale	Oakdale
O. A. Kauffman	a	803 First St., Modesto	Modesto
Frank B. Marks	a	Newman	Newman
Oakdale Irrigation Dist.	a	Oakdale	Oakdale
Pacific Coast Aggregates, Inc.	a, b	85 Second St., San Francisco	Oakdale
Putnam Sand & Gravel Co.	a	Box 486, Modesto	Modesto
Rinehart Sand Pit, H. T. Rinehart	a	Modesto	Modesto
J. P. Scanlon, Scanlon Gravel Pit	a	Patterson	Crows Landing
Chas. Warner	a	Modesto	Modesto
Trinity County			
Northwestern Pacific R.R. Co., Wm. N. Neff, Gen. Sup't.	b	Sausalito	Island Mountain
Tulare County			
Dinuba Cement Co.	a	Dinuba	Dinuba
O. C. Jeffers	a	1032 River Rd., Porterville	Porterville
Pacific Coast Aggregates, Inc.	a, b	85 2d St., San Francisco	Lemon Cove and Lindsay
Porterville Cement Pipe Co.	a	Box 396, Porterville	Porterville
W. R. Spalding Lumber Co.	a, b	Visalia	Visalia

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Tuolumne County			
Beerman & Jones	b	Sonora	Soulsbyville
Ventura County			
Macco Construction Co.	a, b	Santa Paula	Santa Paula
Montalvo Rock Co.	a	Box 188, Montalvo	Montalvo
Piru Rock Co.	a, b	Piru	Piru
Santa Paula Rock Co.	a	Willard Bridge, Santa Paula	Santa Paula
Saticoy Rock Products Co.	a, b	Ventura	Saticoy-Ventura
J. S. Toler	c	1257 Poli St., Ventura	Ventura
Southern Pacific Co.	a, b	65 Market St., San Francisco	Rockbank and Chrisman
Yolo County			
Beckwith Bros.	a	Broderick	Broderick
Leroy Kerr	a	Yolo	Yolo
Joe Schwarzgruber	a	Woodland	Woodland
George Summers	a	Woodland	Woodland
Yolo Gravel Co.	a	Box 7, Yolo	Yolo
Yuba County			
Hemstreet & Bell	a, b	501 11th St., Marysville	Marysville
Pacific Coast Aggregates, Inc.	a	85 2d St., San Francisco	Marysville
Yuba River Sand Co.	a	Marysville	Marysville

a. Sand and gravel. b. Crushed rock (macadam, ballast, rubble, riprap, etc.). c. Molding sand. d. Granules for roofing, terazzo. e. Slag and volcanic cinder. f. Tube mill pebbles. g. Decomposed granite.

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STRONTIUM

Operator	Address	Location of mine
San Bernardino County		
Strontium Carbonate Mines, C. Solomin, Jr.	2457 Scott St., San Francisco	Barstow

SULPHUR

Operator	Address	Location of mine
Inyo County		
Frank and Dan Hicks	Big Pine	Big Pine
Grover Kilhorny	2131 Bonita Dr., Glendale	Zurich
Palmer and Cornell	Big Pine	Big Pine

TITANIUM

Operator	Address	Location of mine
Los Angeles County		
Harry R. Smith	712 S. Citrus Ave., Los Angeles	Hermosa Beach

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Mine	Operator	Address	Location of mine
Fresno County			
Sheridan Property	Hal and Wm. Sheridan	Turlock	Kern River
Inyo County			
Bishop	El Diablo Mining Co., H. O. Johanson	Bishop	Bishop
Pine Creek	U. S. Vanadium Corp.	30 E. 42d St., New York, N. Y.	Bishop
Rossi	Bishop Tungsten Company, A. T. Wilkerson	Bishop	Bishop
Tungsten City	El Diablo Mining Company, H. O. Johanson	Bishop	Bishop
Tungsten City	Tungsten Milling Co., Raymond A. Stolle	Box 461, Bishop	Bishop
Kern County			
Good Hope Mine	M. J. Gusty	Kernville	Kernville
Mono County			
Black Rock Tungsten Mine	Tungsten Corp. of Calif.	811 W. 7th St., Los Angeles	Benton
San Bernardino			
Atolia	Atolia Mining Co.	1022 Crocker Bldg., San Francisco	Atolia
Adelanto	Nicholas Baxter	Adelanto	Adelanto
Tulare County			
Tungsten	Tungsten Mines	929 American Ave., Long Beach	Posey

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SMELTERS, CUSTOM MILLS, ORE AND METAL BUYERS

Reporting purchase of California metals (except gold and silver) produced in 1939

Name	Address	Location of plant	Metals reported purchased
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	El Paso, Texas	Copper, Lead
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Garfield, Utah	Copper, Lead
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Hayden, Ariz.	Copper, Lead
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Murray, Utah	Lead
American Smelting & Ref. Co.	405 Montgomery St., San Francisco	Selby, Calif.	Copper, Lead
American Smelting & Ref. Co.	120 Broadway, New York, N. Y.	Tacoma, Wash.	Copper, Lead
Baker & Co., Inc.	Newark, New Jersey	Newark, N. Y.	Platinum
Bradley & Ekstrom	320 Market St., San Francisco	San Francisco	Chromite
Coast Chemical Distributors, V. R. Ghensberg	403 Sharon Bldg., San Francisco	San Francisco	Quicksilver
International Smelting & Ref. Co.	Tooele, Utah	Tooele, Utah	Copper
Magna Copper Co.	Superior, Ariz.	Superior, Ariz.	Copper
Medford Chemical Co.	1026 Santa Fe, Los Angeles	Los Angeles	Quicksilver
Menardi Metals Co.	2310 E. 52d St., Los Angeles	Vernon	Antimony
Quicksilver Producers Ass'n, Irving Ballard, Sec'y	407 Sansome St., San Francisco	San Francisco	Quicksilver
Pacific Vegetable Oil Co., Bernard T. Rocca	62 Townsend St., San Francisco	San Francisco	Quicksilver
U. S. Smelting, Refining & Mining Co.	Newhouse Bldg., Salt Lake City, Utah	Midvale, Utah	Copper, Lead, Zinc
Western Gold & Platinum Works	589 Bryant St., San Francisco	San Francisco	Platinum
Wildberg Bros. Smelting & Ref. Co.	742 Market St., San Francisco	San Francisco	Platinum

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APPENDIX

PUBLIC RESOURCES CODE

An act to establish a Public Resources Code, thereby consolidating and revising the law relating to natural resources, the conservation, utilization, and supervision thereof, and matters incidental thereto, and to repeal certain acts and parts of acts specified herein.

Chapter 93 (Stat. 1939.)

The people of the State of California do enact as follows:

GENERAL PROVISIONS.

1. This act shall be known as the Public Resources Code.

2. The provisions of this code, in so far as they are substantially the same as existing provisions relating to the same subject matter shall be construed as restatements and continuations thereof and not as new enactments.

3. All persons who, at the time this code goes into effect, hold office under any of the acts repealed by this code, which offices are continued by this code, continue to hold the same according to the former tenure thereof.

4. No action or proceeding commenced before this code takes effect, and no right accrued, is affected by the provisions of this code, but all procedure thereafter taken therein shall conform to the provisions of this code so far as possible.

5. Unless the context otherwise requires, the general provisions hereinafter set forth shall govern the construction of this code.

6. Division, part, chapter, article, and section headings contained herein shall not be deemed to govern, limit, modify or in any manner affect the scope, meaning, or intent of the provisions of any division, part, chapter, article, or section hereof.

7. Whenever, by the provisions of this code, an administrative power is granted to a public officer or a duty imposed upon such officer, the power may be exercised or the duty performed by a deputy of the officer or by a person authorized pursuant to law.

8. Writing includes any form of recorded message capable of comprehension by ordinary visual means. Whenever any notice, report, statement or record is required by this code, it shall be made in writing in the English language.

9. Whenever any reference is made to any portion of this code or of any other law of this State, such reference shall apply to all amendments and additions thereto now or hereafter made.

10. "Section" means a section of this code unless some other statute is specifically mentioned.

11. The present tense includes the past and future tenses; and the future the present.

12. The masculine gender includes the feminine and neuter.

13. The singular number includes the plural, and the plural the singular.

14. "County" includes "city and county."

15. "Shall" is mandatory and "may" is permissive.

16. "Oath" includes affirmation.

17. "Signature" or "subscription" includes mark when the signer or subscriber can not write, such signer's or subscriber's name being written near the mark by a witness who writes his own name near the signer's or subscriber's name; but a signature or subscription by mark can be acknowledged or can serve as a signature or subscription to a sworn statement only when two witnesses so sign their own names thereto.

18. If any provision of this code, or the application thereof to any person or circumstances, is held invalid the remainder of the code, and the application of its provisions to the other persons or circumstances, shall not be affected thereby.

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DIVISION 1. THE DEPARTMENT OF NATURAL RESOURCES.

501. There is in the State government a Department of Natural Resources. The department shall be conducted under the control of an executive officer known as the Director of Natural Resources. The director shall be appointed by and hold office at the pleasure of the Governor and shall receive a salary of six thousand dollars a year.

502. Except as in this division otherwise provided, the provisions of article II, Chapter III, Title I, Part III of the Political Code shall govern and apply to the conduct of the Department of Natural Resources in every respect the same as if such provisions were herein set forth at length, and wherever in that article the term "head of the department" or similar designation occurs, it shall for the purposes of this division mean the Director of Natural Resources.

503. For the purposes of administration the department shall be organized by the director, subject to the approval of the Governor, in such manner as he deems necessary properly to segregate and conduct the work of the department. The director may appoint, in accordance with the civil service and other provisions of law, such deputies, officers, and other expert and clerical assistants as may be necessary.

504. The work of the department shall be divided into at least four divisions, known as Division of Forestry, the Division of Parks, The Division of Fish and Game, and The Division of Mines.

505. The Division of Forestry shall be administered through a chief who shall be known as the State Forester. He shall be a technically trained forester, appointed by the director upon nomination by the State Board of Forestry. General policies for the guidance of the Division of Forestry shall be determined by a State Board of Forestry which shall consist of seven members appointed by and holding office at the pleasure of the Governor. Of the seven members one shall be familiar with the pine timber industry, one with the redwood industry, one with live stock industry, one with general agriculture, and one with the problems of water conservation.

506. The Division of Parks shall be administered through a chief who shall be appointed by the director upon nomination by the State Park Commission. General policies for the administration of the State park system shall be determined by the State Park Commission which shall consist of five members appointed by and holding office at the pleasure of the Governor.

507. The Division of Mines shall be administered through a chief who shall be known as the State Mineralogist. He shall be a technically trained mining engineer, appointed by the director upon nomination by the State Mining Board. General policies for the guidance of the Division of Mines shall be determined by a State Mining Board, which shall consist of five members appointed by and holding office at the pleasure of the Governor.

508. The Division of the Department of Natural Resources for the supervision of oil and gas shall be in charge of a chief, known as the State Oil and Gas Supervisor.

509. The salaries of the chiefs of the Divisions of Forestry and Parks shall be fixed by the director with the approval of the Governor. The director and the chief of each division, before entering upon his duties, shall execute and deliver to the State an official bond in the sum of twenty-five thousand dollars conditioned upon the faithful performance of his duties.

510. The members of the Board of Forestry and the State Park Commission shall serve without compensation, but shall be entitled to their actual necessary expenses incurred in the performance of their duties.

512. The Department of Natural Resources may expend the money in any appropriation or in any special fund in the State treasury made available by law for the administration of the statutes the administration of which is committed to the department, or for the use, support, or maintenance of any board, bureau, commission, department, office, or officer whose duties, powers, and functions have been transferred to and conferred upon the department. Such expenditures by the department shall be made in accordance with law in carrying out the purposes for which the appropriations were made or the special funds created.

513. The department shall have possession and control of all records, books, papers, offices, equipment, supplies, moneys, funds, appropriations, land and other property, real or personal held for the benefit or use of all bodies, offices, and

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officers whose duties, powers, and functions have been transferred to and conferred upon the department.

514. Nothing in this code is intended to supersede, modify or change the effect of the enactment of section 373g of the Political Code, and wherever in this code reference is made to any officer or agency of the Department of Natural Resources, it is made in the sense and with the same legal effect as was attributable thereto in the statute whence derived and which would continue to be so attributable but for the adoption of this code.

DIVISION II. MINES AND MINING.

CHAPTER 1. DEFINITIONS.

2001. Unless the context otherwise requires, the definitions hereinafter set forth shall govern the construction of Division II of this code.

2002. "Department" in reference to the government of this State, means the Department of Natural Resources.

2003. "Division" in reference to the government of this State, means the Division of Mines in the Department of Natural Resources.

2004. "Person" includes any individual, firm, association, corporation, or any other group or combination acting as a unit.

CHAPTER 2. THE DIVISION OF MINES.

2200. For the purposes of this chapter "mine" includes all mineral bearing properties of whatever kind or character, whether underground, quarry, pit, well, spring or other source from which any mineral substance is or may be obtained. "Mineral" for the purposes of this chapter includes all mineral products both metallic and nonmetallic, solid, liquid or gaseous, and mineral waters of whatever kind or character.

2201. The State Mineralogist shall employ competent geologists, field assistants, qualified specialists, and office employees when necessary in the execution of the plans and operations of the division under this chapter and shall fix their compensation.

2202. The State Mineralogist shall maintain offices, and a museum, library, and laboratory in San Francisco for the purposes provided in this chapter.

2203. The State Mineralogist shall make a biennial report to the Governor on or before the fifteenth day of September next preceding the regular session of the Legislature.

2204. The State Mineralogist may receive on behalf of this State, for the use and benefit of the division, gifts, bequests, devices, and legacies of real or other property and may use the same in accordance with the wishes of the donors. If no instructions are given by the donors, the State Mineralogist shall manage, use, and dispose of the gifts, bequests, and legacies for the best interests of the division and in such manner as he may deem proper.

2205. The State Mineralogist shall:

(a) Make, facilitate, and encourage special studies of the mineral resources and mineral industries of the State.

(b) Collect statistics concerning the ocurrence and production of the economically important minerals and the methods pursued in making their valuable constituents available for commercial use.

(c) Make a collection of typical geological and mineralogical specimens, especially those of economic and commercial importance such collection constituting the museum of the division.

(d) Provide a library of books, reports, and drawings bearing upon the mineral industries, the sciences of mineralogy and geology, and the arts of mining and metallurgy, such library constituting the library of the division.

(e) Make a collection of models, drawings, and descriptions of the mechanical appliances used in mining and metallurgical processes.

(f) Preserve and so maintain such collections and library as to make them available for reference and examination, and open to public inspection at reasonable hours.

(g) Maintain, in effect, a bureau of information concerning the mineral industry of this State to consist of such collections and library, and arrange, classify,

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catalogue, and index the data therein contained, in a manner to make the information available to those desiring it.

(h) Issue from time to time such bulletins as he may deem advisable concerning the statistics and technology of the mineral industries of this State.

2206. The State Mineralogist may prepare a special collection of ores and minerals of California to be sent to or used at any world's fair or exposition in order to display the mineral wealth of the State.

2207. The owner, lessor, lessee, agent, manager, or other person in charge of any mine of whatever kind or character within the State shall forward to the State Mineralogist, upon his request, at his office, not later than the thirty-first day of March in each year, a detailed report upon forms which will be furnished showing the character of the mine, the number of men employed, the method of working the mine and the general condition thereof, and the total mineral production for the past year. He shall also furnish any additional information relative to such mine that the State Mineralogist may from time to time require for the proper discharge of his official duties. Any such person who fails to comply with the provisions of this section is guilty of a misdemeanor.*

2208. The State Mineralogist or a qualified assistant may at any time enter or examine any and all mines, quarries, wells, mills, reduction works, refining works, and other mineral properties or working plants in this State in order to gather data to comply with the provisions of this chapter.

2209. The State Mineralogist may fix a price upon and dispose of to the public all publications of the division, including reports, bulletins, maps, registers, or other publications. The price shall approximate the cost of publication and distribution. He may also furnish the publications of the division to public libraries without cost and may exchange publications with geological surveys, scientific societies, and other like bodies.

2210. All money received by the division from sales of publications issued by the division shall be deposited at least once each month in the State treasury to the credit of the Division of Mines revolving printing fund, which fund is continued in existence. This fund is appropriated for the use of the division, in addition to such other funds as may be appropriated, for the printing and publishing of reports, bulletins, and maps issued by the division. The State Controller may require financial reports from the division or any officer thereof.

(Added by Stats. 1939, Ch. 96, as part of codification.)

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* Sec. 19 of the Penal Code of California provides: "Except in cases where a different punishment is prescribed by this code, every offense declared to be a misdemeanor is punishable by imprisonment in a county jail not exceeding six months, or by a fine not exceeding five hundred dollars, or by both."

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PUBLICATIONS OF THE DIVISION OF MINES

During the past fifty-six years, in carrying out the provisions of the organic act creating the former California State Mining Bureau, there have been published many reports, bulletins and maps which go to make up a library of detailed information on the mineral industry of the State, a large part of which could not be duplicated from any other source.

One feature that has added to the popularity of the publications is that many of them have been distributed without cost to the public, and even the more elaborate ones have been sold at a price which barely covers the cost of printing.

Owing to the fact that funds for the advancing of the work of this department have usually been limited, the reports and bulletins mentioned are printed in limited editions many of which are now entirely exhausted.

Copies of such publications are available for reference, however, in the offices of the Division of Mines, in the Ferry Building, San Francisco; State Building, Los Angeles; State Office Building, Sacramento; Redding; and Division of Oil and Gas at Santa Barbara, Santa Paula, Taft, Bakersfield, Coalinga. They may also be found in many public, private and technical libraries in California and other states and foreign countries.

A catalog of all publications from 1880 to 1917, giving a synopsis of their contents, is issued as Bulletin No. 77.

Publications in stock may be obtained postpaid by addressing the San Francisco, Los Angeles or Sacramento offices and enclosing the requisite amount.

Remittances of stamps in an amount not to exceed 26 cents, currency or coin will be accepted at sender's risk. Payment is preferred in the form of money orders.

Money orders should be made payable to the Division of Mines.

NOTE.—The Division of Mines frequently receives requests for some of the early Reports and Bulletins now out of print, and it will be appreciated if parties having such publications and wishing to dispose of them will advise this office.

Write for latest revised price list.

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REPORTS

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	Price (including postage and sales tax)
**First Annual Report of the State Mineralogist, 1880, 43 pp. Henry G. Hanks	----
**Second Annual Report of the State Mineralogist, 1882, 514 pp., 4 illustrations, 1 map. Henry G. Hanks	----
**Third Annual Report of the State Mineralogist, 1883, 111 pp., 21 illustrations. Henry G. Hanks	----
**Fourth Annual Report of the State Mineralogist, 1884, 410 pp., 7 illustrations. Henry G. Hanks	----
**Fifth Annual Report of the State Mineralogist, 1885, 234 pp., 15 illustrations, 1 geological map. Henry G. Hanks	----
Sixth Annual Report of the State Mineralogist, Part I, 1886, 145 pp., 3 illustrations, 1 map. Henry G. Hanks--Price $0.75, sales tax $0.02	$0.77
Part II, 1887, 222 pp., 36 illustrations. William Irelan, Jr.--Price $0.75, sales tax $0.02	.77
**Seventh Annual Report of the State Mineralogist, 1887, 315 pp. William Irelan, Jr.	----
**Eighth Annual Report of the State Mineralogist, 1888, 948 pp., 122 illustrations. William Irelan, Jr.	----
**Ninth Annual Report of the State Mineralogist, 1889, 352 pp., 57 illustrations, 2 maps. William Irelan, Jr.	----
**Tenth Annual Report of the State Mineralogist, 1890, 983 pp., 179 illustrations, 10 maps. William Irelan, Jr.	----
Eleventh Report (First Biennial) of the State Mineralogist, for the two years ending September 15, 1892, 612 pp., 73 illustrations, 4 maps. William Irelan, Jr.--Price $1.50, sales tax $0.05	1.55
**Twelfth Report (Second Biennial) of the State Mineralogist, for the two years ending September 15, 1894, 541 pp., 101 illustrations, 5 maps. J. J. Crawford	----
**Thirteenth Report (Third Biennial) of the State Mineralogist, for the two years ending September 15, 1896, 726 pp., 93 illustrations, 1 map. J. J. Crawford	----
Chapters of the State Mineralogist's Report, XIV Biennial Period, 1913-1914, Fletcher Hamilton:	
**Mines and Mineral Resources, Amador, Calaveras and Tuolumne Counties, 172 pp., paper	----
Mines and Mineral Resources, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma and Yolo Counties, 208 pp., paper--Price $0.75, sales tax $0.02	.77
**Mines and Mineral Resources, Del Norte, Humboldt and Mendocino Counties, 59 pp., paper	----
**Mines and Mineral Resources, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin and Stanislaus Counties, 220 pp., paper	----
**Mines and Mineral Resources of Imperial and San Diego Counties, 113 pp., paper	----
**Mines and Mineral Resources, Shasta, Siskiyou and Trinity Counties, 180 pp., paper	----
**Fourteenth Report of the State Mineralogist, for the Biennial Period 1913-1914, Fletcher Hamilton, 1915: A General Report on the Mines and Mineral Resources of Amador, Calaveras, Tuolumne, Colusa, Glenn, Lake, Marin, Napa, Solano, Sonoma, Yolo, Del Norte, Humboldt, Mendocino, Fresno, Kern, Kings, Madera, Mariposa, Merced, San Joaquin, Stanislaus, San Diego, Imperial, Shasta, Siskiyou and Trinity Counties, 974 pp., 275 illustrations, cloth	----
Chapters of the State Mineralogist's Report, XV Biennial Period, 1915-1916, Fletcher Hamilton:	
**Mines and Mineral Resources, Alpine, Inyo and Mono Counties, 176 pp., paper	----
Mines and Mineral Resources, Butte, Lassen, Modoc, Sutter and Tehama Counties, 91 pp., paper--Price $0.75, sales tax $0.02	.77

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Mines and Mineral Resources, El Dorado, Placer, Sacramento and Yuba Counties, 198 pp., paper—Price $0.75, sales tax $0.02	$0.77
Mines and Mineral Resources, Monterey, San Benito, San Luis Obispo, Santa Barbara and Ventura Counties, 183 pp., paper—Price $0.75, sales tax $0.02	.77
**Mines and Mineral Resources, Los Angeles, Orange and Riverside Counties, 136 pp., paper	----
**Mines and Mineral Resources, San Bernardino and Tulare Counties, 186 pp., paper	----
**Fifteenth Report of the State Mineralogist, for the Biennial Period 1915-1916, Fletcher Hamilton, 1917: A General Report on the Mines and Mineral Resources of Alpine, Inyo, Mono, Butte, Lassen, Modoc, Sutter, Tehama, Placer, Sacramento, Yuba, Los Angeles, Orange, Riverside, San Benito, San Luis Obispo, Santa Barbara, Ventura, San Bernardino and Tulare Counties, 990 pp., 413 illustrations, cloth	----
Chapters of the State Mineralogist's Report XVI, Biennial Period, 1917-1918, Fletcher Hamilton:	
Mines and Mineral Resources of Nevada County, 270 pp., paper—Price $1.00, sales tax $0.03	1.03
Mines and Mineral Resources of Plumas County, 188 pp., paper—Price $0.75, sales tax $0.02	.77
Mines and Mineral Resources of Sierra County, 144 pp., paper—Price $0.75, sales tax $0.02	.77
Seventeenth Report of the State Mineralogist, 1920, 'Mining in California during 1920,' Fletcher Hamilton; 562 pp., 71 illustrations, cloth—Price $2.50, sales tax $0.08	2.58
Eighteenth Report of the State Mineralogist, 1922, 'Mining in California,' Fletcher Hamilton. Chapters published monthly beginning with January, 1922:	
**January, **February, **March, **April, May, June, July, August, September, October, November, December, 1922—Price $0.40, sales tax $0.01	.41
Chapters of Nineteenth Report of the State Mineralogist, 'Mining in California,' Fletcher Hamilton and Lloyd L. Root. January, February, March, September, 1923—Price $0.40, sales tax $0.01	.41
Chapters of Twentieth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly. January, April, July, October, 1924, per copy—Price $0.40, sales tax $0.01	.41
Chapters of Twenty-first Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	
January, 1925, Mines and Mineral Resources of Sacramento, Monterey and Orange Counties—Price $0.40, sales tax $0.01	.41
April, 1925, Mines and Mineral Resources of Calaveras, Merced, San Joaquin, Stanislaus and Ventura Counties—Price $0.40, sales tax $0.01	.41
**July, 1925, Mines and Mineral Resources of Del Norte, Humboldt and San Diego Counties	----
**October, 1925, Mines and Mineral Resources of Siskiyou, San Luis Obispo and Santa Barbara Counties	----
Chapters of Twenty-second Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	
**January, 1926, Mines and Mineral Resources of Trinity and Santa Cruz Counties	----
April, 1926, Mines and Mineral Resources of Shasta, San Benito and Imperial Counties—Price $0.40, sales tax $0.01	.41
July, 1926, Mines and Mineral Resources of Marin and Sonoma Counties—Price $0.40, sales tax $0.01	.41
**October, 1926, Mines and Mineral Resources of El Dorado and Inyo Counties, also report on Minaret District, Madera County	----
Chapters of Twenty-third Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	

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January, 1927, Mines and Mineral Resources of Contra Costa County; Santa Catalina Island—Price $0.40, sales tax $0.01	$0.41
April, 1927, Mines and Mineral Resources of Amador and Solano Counties—Price $0.40, sales tax $0.01	.41
**July, 1927, Mines and Mineral Resources of Placer and Los Angeles Counties	--
October, 1927, Mines and Mineral Resources of Mono County—Price $0.40, sales tax $0.01	.41
Chapters of Twenty-fourth Report of the State Mineralogist, 'Mining in California,' Lloyd L. Root. Published quarterly:	
January, 1928, Mines and Mineral Resources of Tuolumne County—Price $0.40, sales tax $0.01	.41
April, 1928, Mines and Mineral Resources of Mariposa County—Price $0.40, sales tax $0.01	.41
**July, 1928, Mines and Mineral Resources of Butte and Tehama Counties	----
October, 1928, Mines and Mineral Resources of Plumas and Madera Counties—Price $0.40, sales tax $0.01	.41
Chapters of Twenty-fifth Report of the State Mineralogist, 'Mining in California,' Walter W. Bradley. Published quarterly:	
**January, 1929, Mines and Mineral Resources of Lassen, Modoc and Kern Counties; also on Special Placer Machines	----
**April, 1929, Mines and Mineral Resources of Sierra, Napa, San Francisco and San Mateo Counties	----
July, 1929, Mines and Mineral Resources of Colusa, Fresno and Lake Counties—Price $0.40, sales tax $0.01	.41
October, 1929, Mines and Mineral Resources of Glenn, Alameda, Mendocino and Riverside Counties—Price $0.40, sales tax $0.01	.41
Chapters of Twenty-sixth Report of the State Mineralogist, 'Mining in California,' Walter W. Bradley. Published quarterly:	
January, 1930, Mines and Mineral Resources of Santa Clara County; also Barite in California—Price $0.40, sales tax $0.01	.41
**April, 1930, Mines and Mineral Resources of Nevada County; also Mineral Paint Materials in California	----
**July, 1930, Mines and Mineral Resources of Yuba and San Bernardino Counties; also Commercial Grinding Plants in California	----
October, 1930, Mines and Mineral Resources of Butte, Kings and Tulare Counties; also Geology of Southwestern Mono County (Preliminary) Price $0.40, sales tax $0.01	.41
Chapters of Twenty-seventh Report of the State Mineralogist, 'Mining in California,' Walter W. Bradley. Published quarterly:	
January, 1931. Preliminary Report of Economic Geology of the Shasta Quadrangle. Beryllium and Beryl. The New Tariff and Nonmetallic Products. Crystalline Talc. Decorative Effects in Concrete—Price $0.40, sales tax $0.01	.41
April, 1931, Stratigraphy of the Kreyenhagen Shale. Diatoms and Silicoflagellates of the Kreyenhagen Shale. Foraminifera of the Kreyenhagen Shale. Geology of Santa Cruz Island—Price $0.40, sales tax $0.01	.41
**July, 1931. (Yuba, San Bernardino.) Feldspar, Silica, Andalusite and Cyanite Deposits of California. Note on a Deposit of Andalusite in Mono County; its occurrence and chemical importance. Bill creating Trinity and Klamath River Fish and Game District and its effect upon mining	----
October, 1931. (Alpine.) Geology of the San Jacinto Quadrangle south of San Gorgonio Pass, California. Notes on Mining Activities in Inyo and Mono Counties in July, 1931—Price $0.40, sales tax $0.01	.41
Chapters of Twenty-eighth Report of the State Mineralogist, 'Mining in California,' Walter W. Bradley. Published quarterly:	
January, 1932, Economic Mineral Deposits of the San Jacinto Quadrangle. Geology and Physical Properties of Building Stone from Car-	

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mel Valley. Contributions to the Study of Sediments. Sediments of Monterey Bay. Sanbornite_____Price $0.40, sales tax $0.01	$0.41
**April, 1932. Elementary Placer Mining Methods and Gold Saving Devices. The Pan, Rocker and Sluice Box. Prospecting for Vein Deposits. Bibliography of Placer Mining_____	----
Abstract from April quarterly: Elementary Placer Mining Methods and Gold Saving Devices. Types of Deposits, Simple Equipment. Special Machines. Dry Washing. Black Sand Treatment. Marketing of Products. Placer Mining Areas. Laws. Prospecting for Quartz Veins. Bibliography (mimeographed) _____Free, postage $0.05	.05
**July-October. (Ventura.) Report accompanying Geologic Map of Northern Sierra Nevada. Fossil Plants in Auriferous Gravels of the Sierra Nevada. Glacial and Associated Stream Deposits of the Sierra Nevada. Jurassic and Cretaceous Divisions in the Knoxville-Shasta Succession of California. Geology of a part of the Panamint Range. Economic Report of a Part of the Panamint Range. Acquiring Mining Claims Through Tax Title. The Biennial Report of State Mineralogist _____	----
Chapters of Report XXIX, 1933 (quarterly): titled 'California Journal of Mines and Geology,' containing the following:	
January-April. Gold Deposits of the Redding and Weaverville Quadrangles. Geologic Formations of the Redding-Weaverville District, Northern California. Geology of Portions of Del Norte and Siskiyou Counties. Applications of Geology to Civil Engineering. The Lakes of California. Discovery of Piedmontite in the Sierra Nevada. Tracing 'Buried River' Channel Deposits by Geomagnetic Methods. Geologic Map of Redding-Weaverville District, showing gold mines and prospects. Geologic map showing various mines and prospects of part of Del Norte and Siskiyou Counties_____ Price $1.00, sales tax $0.03	1.03
July-October. Gold Resources of Kern County. Limestone Deposits of the San Francisco Region. Limestone Weathering and Plant Associations of the San Francisco Region. Booming, Death Valley National Monument, California. Placer Mining Districts, Senate Bill 480. Navigable Waters, Assembly Bill 1543_____ Price $1.00, sales tax $0.03	1.03
Chapters of Report XXX, 1934 (quarterly): titled 'California Journal of Mines and Geology,' containing the following:	
January. Resurrection of Early Surfaces in the Sierra Nevada. Geology and Mineral Resources of Northeastern Madera County. Geology and Mineral Deposits of Laurel and Convict Basins, Southwestern Mono County. Notes on Sampling as Applied to Gold Quartz Deposits___ Price $0.60, sales tax $0.02	.62
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October. Current Mining Developments in Northern California. Current Mining Activity in Southern California. Geology and Mineral Resources of the Julian District, San Diego County. Geology and Mineral Resources of Elizabeth Lake Quadrangle. Dry Placers of Northern Mojave Desert. Biennial Report of State Mineralogist. Assessment Work Within Withdrawn Areas_____ Price $0.60, sales tax $0.02	.62
Chapters of Report XXI, 1935 (quarterly): titled 'California Journal of Mines and Geology,' containing the following:	
January. Review of Gold Mining in East-Central, 1934. Current Mining Activities in the San Francisco District with Special Reference to Gold. Geological Investigation of the Clays of Riverside and Orange Counties, Southern California. Information regarding Mining Loans by the Reconstruction Finance Corporation_____ Price $0.60, sales tax $0.02	.62

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July. Mines and Mineral Resources of Siskiyou County (with map). Dams for Hydraulic Mining Debris. Leasing System as Applied to Metal Mining. Mine Financing in California. New Laws Make Radical Change in Mining Rights------Price $0.60, sales tax $0.02 .62

October. Mines and Mineral Resources of San Luis Obispo County. Mineral Resources of Portions of Monterey and Kings Counties. Mining Activity at Soledad Mountain and Middle Buttes—Mojave District, Kern County. Geology of a Portion of the Perris Block, Southern California. Mineral Resources of a Portion of the Perris Block, Riverside County ----------Price $0.60, sales tax $0.02 .62

Chapters of Report XXXII, 1936 (quarterly): titled 'California Journal of Mines and Geology,' containing the following:

January. Gold Mines of Placer County, including Drag-line Dredges. Geologic Report on Borax Lake, California----------
Price $0.60, sales tax $0.02 .62

April. Geology, Mining and Processing of Diatomite at Lompoc, Santa Barbara County. Essentials in Developing and Financing a Prospect into a Mine. Gold-bearing Veins of Meadow Lake District, Nevada County. Semi-Precious Gem Stone Collection in Division Museum--
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July. Mines and Mineral Resources of Calaveras County. Mining in California by Power Shovel. Assessment Work on Mining Claims Within Withdrawn Areas. Joshua Tree National Monument. Cost of Producing Quicksilver at a California Mine in 1931-1932. The Age of Mineral Utilization----------Price $0.60, sales tax $0.02 .62

October. Mineral Resources of Lassen and Modoc Counties. Mechanics of Lone Mountain Landslides, San Francisco. Biennial Report of the State Mineralogist, Properties and Industrial Applications of Opaline Silica ----------Price $0.60, sales tax $0.02 .62

Chapters of Report XXXIII, 1937 (quarterly): titled 'California Journal of Mines and Geology,' containing the following:

January. Source Data of the Geologic Map of California, January, 1937. The Geology of Quicksilver Ore Deposits. Prospecting for Lode Gold ----------Price $0.60, sales tax $0.02 .62

April. Mineral Resources of Plumas County (with Geologic Map). List of preferred mineral names. New Placer Mining Debris Law
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Samples (limited to two at one time) of any mineral found in the State may be sent to the Division of Mines for identification, and the same will be classified free of charge. No samples will be determined if received from points outside the State. It must be understood that no assays, or quantitative determinations will be made. Samples should be in lump form if possible, and marked plainly with name of sender on outside of package, etc. No samples will be received unless delivery charges are prepaid. A letter should accompany sample, giving locality where mineral was found and the nature of the information desired.

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INDEX

Page

Acreage proven oil and natural gas land 31
Agricultural limestone 94
Alameda County 120
Alpine County 121
Alum (native) 109
  producer 146
Aluminum 32–33
Amador County 121
Amblygonite 95
American Petroleum Institute, cited 23–24, 25
American Potash and Chemical Co., photos of 115
Andalusite 103
Antimony 33
  producers 146
  use of 33
Appendix 199–200
Architectural terra cotta 85
Arsenic 33
Art pottery 85
Asbestos 79–80
  use 79
Ash, volcanic 100
Asphalt 60
Bancroft, H. H., cited 42
Barite 80–81
  duty on 80
  producers 146
  total production 81
Ballast, railroad 76
Bauxite 32
Benitoite 90
Bentonite 81–82
  producers 147
  total production 82
Beryl 34–90
Beryllium 34
Bismuth 34
  use of 34
Bituminous rock 60–61
  producers 147
  total production 61
Borates 110–111
  exports 110
  producers 148
  production, 1864-1939 111
Bradley, Walter W., cited 21, 63, 93, 115
Brick 61–62
  producers 151–154
  production of various kinds 61
  total production, 1893-1939 62
Bromine 112
  producer 148
Brown, J. R., cited 38
Building stone. (*See* Granite, Marble, Sandstone, etc.)
Butte County 121–122
Cadmium 34–35
Calaveras County 122
Calcium chloride 112–113
  producer 149
  silicate 82–83
  producer 149
California, area of 119
  Oil and Gas Association, cited 20
Californite 90
Carbon dioxide gas (natural) produced 83
  producers 149
Carmel stone 70
Casinghead gas 18–19
Celestite 55
Cement 62–64
  natural 63
  producers 150
  total production 64
Chemical stoneware 85

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INDEX—Continued

Page

Chimney pipe ---- 85
Chinaware ---- 85
Chromite ---- 35–36
  imports of ---- 36
  occurrence of ---- 35
  producers ---- 150
  total production ---- 36
  use of ---- 35
Chrysoprase ---- 91
Clay for oil well drilling mud ---- 85
Clay, pottery ---- 83–86
  producers ---- 151–154
  production, 1887-1939 ---- 86
  products ---- 85
  uses of, other than for pottery ---- 85
Coal ---- 15–16
  producer ---- 155
  total production of ---- 16
Cobalt ---- 37
Colemanite ---- 110
Colusa County ---- 122
Concrete, rock for ---- 76
Conduit ---- 85
Contra Costa County ---- 123
Copper ---- 37, 38
  producers ---- 155
  production, 1882-1939 ---- 38
  United States, production of ---- 38
Counties, mineral production of ---- 13, 119–144
Crater Sulphur Mine photo of ---- 107
Cronise, T. F., cited ---- 99
Crushed rock ---- 75–76
  producers ---- 186–193
Cryolite ---- 32
Curying ---- 64
Cyanite ---- 103
Day, D. T., cited ---- 36
Del Norte County ---- 123
Department of Natural Resources Code ---- 198
Diamonds ---- 90
Diatomaceous earth. (*See* diatomite.)
Diatomite ---- 86–87
  producers ---- 156
  total production of ---- 87
Directory of producers ---- 145–196
Dolomite ---- 87–88
  producers ---- 156
  total production ---- 88
Drain tile ---- 85
Dumortierite ---- 103
Duty on barytes ---- 80
  fuller's earth ---- 82
  glass sand ---- 102
  magnesite ---- 67
  manganese ---- 47
  molybdenum ---- 48
  soapstone and talc ---- 104
  tungsten ---- 57
El Dorado County ---- 123–124
Electric smelting of ferro alloys ---- 44
Electrical porcelain ---- 85
Eng. and Min. Jour., cited ---- 46, 50
Exports of borates ---- 110
Faience tile ---- 85
Feldspar ---- 88–89
  producer ---- 157
  total production ---- 89
Ferro-chrome by electric furnace ---- 44
  -manganese by electric furnace ---- 44
  -silicon by electric furnace ---- 44
Fertilizers. (*See* Gypsum, Limestone, Phosphates, Potash.)
Fire brick ---- 61
  clay ---- 85
Flue linings ---- 85
Fluorspar ---- 89
Fresno County ---- 124
Fuels ---- 15–31
Fuller's earth. (*See* Bentonite.)
  duty on ---- 82
  producers ---- 147

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INDEX—Continued

Page

Garnets (abrasive) ---- 89
producer ---- 157
Garnets (gem) ---- 91
Gas. (*See* Natural gas.)
Gasoline from natural gas ---- 18–19
Gaylord, H. M., cited ---- 41–42, 53–54
Gems ---- 90–91
producers ---- 157
total production ---- 91
varieties ---- 90
Glass sand ---- 102
duty on ---- 102
Glenn County ---- 124
Gold ---- 39–43
number of operating properties ---- 40
principal producers ---- 158–165
production by counties, 1939 ---- 40
total production ---- 42-43
value 1887-1939 ---- 14
Goodyear, W. A., cited ---- 16
Granite ---- 64–65
decomposed ---- 76
producers ---- 166
production, 1887-1939 ---- 65
varieties of, in California ---- 65
Granules for roofing and stucco ---- 76
Graphite ---- 91–92
total production ---- 92
Gravel ---- 74
Grinding-mill pebbles ---- 73
producer ---- 192
Gypsum ---- 92–94
producers ---- 167
total production ---- 94
Hague, J. M., photo by ---- 56
Hanks, Henry, cited ---- 21
Hittell, T. H. cited ---- 42
Hollow building tile or blocks ---- 61–62
Hübernite ---- 57
Humboldt County ---- 125
Imperial County ---- 125
Imports of Chromite ---- 36
Magnesite ---- 67
Manganese ---- 46
Potash ---- 115
Quicksilver ---- 50
Talc and soapstone ---- 104
Tungsten ---- 57
Industrial limestone ---- 94
Industrial materials ---- 78–108
Infusorial earth ---- 87
Introduction ---- 9
Inyo County ---- 125–126
Iodine ---- 113
producers ---- 168
Iridium. (*See* Platinum.)
Iron ore ---- 44
producers ---- 168
total production ---- 44
Jewelers' materials. (*See* Gems.)
Kern County ---- 126
Kernite ---- 110
Kieselguhr ---- 86
Kings County ---- 126–127
Knudsen, E. T., cited ---- 19, 25
Kramerite ---- 111
Kunzite ---- 90
Lake County ---- 127
Lassen County ---- 127
Lead ---- 45–46
producers ---- 169
production, 1877-1939 ---- 46
of United States ---- 45
Lepidolite ---- 95–96
Letter of Transmittal ---- 7
Lime ---- 66
producers ---- 170
production, 1894-1939 ---- 66

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INDEX—Continued

Page

Limestone ---- 94–95
producers ---- 170
production, 1894-1939 ---- 95
Lithia ---- 95–96
producer ---- 171
Los Angeles County ---- 128
Macadam ---- 76
Madera County ---- 128
Magnesite ---- 66–68
duty on ---- 67
imports of ---- 67
occurrence of ---- 67
producer ---- 171
production, 1887-1939 ---- 68
Magnesium salts ---- 113–114
producers ---- 171
production by years ---- 114
Manganese ---- 46–47
duty on ---- 47
imports of ---- 46
producer ---- 172
total production ---- 47
Marble ---- 68–69
producers ---- 172
production, 1887-1939 ---- 69
Marin County ---- 129
Mariposa County ---- 129
Medicinal salts ---- 116
McCaskey, H. D., cited ---- 54
Mendocino County ---- 130
Mercantile Trust Review, cited ---- 42, 63
Merced County ---- 130
Merrill, Charles White, cited ---- 41–42, 53–54
Metal & Mineral Markets, cited ---- 33, 34, 35, 37, 48, 49, 55, 56
Metals ---- 32–58
Mica ---- 96–97
uses ---- 96
Mineral Yearbook, cited ---- 41–42, 53–54
Minerals, county ---- 13
industry, review of ---- 11
output by counties ---- 13, 118–144
by substances ---- 12
output, comparative value, 1938-1939 ---- 12
paint ---- 97–98
production, 1890-1937 ---- 98
production, 1887-1939 ---- 14
water ---- 98–99
producers ---- 173–174
production, 1887-1939 ---- 98
Minerals
total production of, by years ---- 14
variety of, produced in California ---- 12
Mineral Resources West of Rocky Mountains, cited ---- 38
Mining and Scientific Press, cited ---- 23
Mines and Mining, code ---- 199–200
Miscellaneous stone ---- 72–77
producers ---- 186–193
production, 1893-1939 ---- 77
Modoc County ---- 130
Molding sand ---- 73
Molybdenum ---- 47–48
duty on ---- 48
producer ---- 175
Mono County ---- 131
Monterey County ---- 131
Montmorillonite ---- 81
Monumental stone ---- 65
Names of producers in ---- 145–196
Napa County ---- 131–132
Natural gas ---- 16–19
amount produced, utilized, wasted and stored ---- 17
distribution by counties ---- 17
gasoline from ---- 18–19
production, 1888-1939 ---- 18
production and value ---- 17
Nevada County ---- 132
Nickel ---- 48
Nitrates ---- 114–115
Nitrogen, atmospheric, fixation of ---- 115

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INDEX—Continued

	Page
Oil. (*See* Petroleum.)	
in storage	25
land, proven	31
shale	101
utilization of	25
well data	24
well drilling mud	85
wells operated by fields	26
Onyx	69
Orange County	132–133
Osmium. (*See* Platinum.)	
Pacific Coast Borax Co. Mine, photo of	111
Pacific Portland Cement Co. gypsum plant, photo of	93
Palladium. (*See* Platinum.)	
Paving blocks	73
Peat	15
Pebbles for grinding mills	73
Petroleum	19–31
average price by counties, 1929-1939	20
number of producing wells	24, 28–30
operating data	27
production, 1875-1939	23
production and value by counties	20
production by fields	26
production of light and heavy gravities	26
products, production of	27–30
specific gravity of	25
statistics of well operations	28–30
storage of	25
total production	21–23
value, 1887-1939	14
yield per day of wells	24, 28–30
Phosphates	99
Pine Creek Tungsten Mine, photo of	56
Placer County	133
Plaster and brick sand	74
Platinum	49
prices	49
producers	175
production of, 1887-1939	49
Playa Del Rey Oil Field, photo of	21
Plumas County	133
Porcelain	85
Potash	115–116
imports	115
producer	176
total production of	116
Pottery clays	85
Probertite	111
Public Resources Code	197–200
Pumice	100
producers	176
total production	100
Pyrites	100–101
producers	177
total production	101
Pyroxine	82
Quartz	102
crystals. (*See* Gems.)	
Quicksilver	50–52
imports	50
prices	50
producers	177–179
production, 1850-1939	52
production of, in United States	50
Randol, J. B., cited	51
Ransom, A. L., photo by	51
Red earthenware	85
Riprap	76
Riverside County	134
Portland Cement Co., photo of	63
Rock, crushed	76
Roofing granules	76
slate	71
tile	85
Rubble	76
Rubies	91
Ruthenium. (*See* Platinum.)	
Sacramento County	134
Salinas	109–118

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INDEX—Continued

	Page
Salt	116–117
producers	179
production, 1887-1939	117
Salt Cake	117
San Benito County	135
San Bernardino County	135
San Diego County	136
San Francisco Bulletin, cited	21
County	136
San Joaquin County	136-137
San Luis Obispo County	137
San Mateo County	137
Sand, glass	102
Sand and gravel	73
producers	186–193
Sandstone	70
producers	180
production, 1887-1939	70
Sanitary ware	85
Santa Barbara County	138
Santa Clara County	138
Santa Cruz County	138-139
Sapphires	91
Scheelite	57
Scoria	100
Semivitreous tableware	85
Serpentine	70–71
Sewer pipe	85
Shale oil	101–102
Shasta County	139
Siebenthal, C. E., cited	46
Sierra County	139
Silica	102–103
producers	181
total production	103
Sillimanite group	103–104
producer	181
Silver	52–54
principal producers	182–183
production by counties	53
production, 1880-1939	54
Siskiyou County	140
Slate	71–72
producers	184
production, 1889-1939	71
roofing granules	71
Soapstone	104–106
composition	104
duty on	104
imports of	104
producers	184
total production	106
use	105
varieties	104
Soda	117–118
producers	185
total production	118
Solano County	140
Sonoma County	140
Spark plugs, andalusite for	103
Specific gravities of oil produced	25
Spelter. (*See* Zinc.)	
Standard Oil Company, cited	20, 25, 26
Stanislaus County	141
State Mineralogist Report, cited	44
Mining Bureau, cited	52
Oil and Gas, cited	31
Stone, miscellaneous	72–77
producers	186–193
production by counties	76
production by years	77
Stoneware	85
Strontium	106–107
producer	194
Structural materials	59–77
Sulphur	107–108
producer	194
production by years	108
Sulphur Bank Quicksilver Mine, photos of	51
Summary of Mineral Industry, 1939	11
Summary of Operations, California Oil Fields, cited	27–30
Sutter County	141

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INDEX—Continued

	Page
Talc	104–106
duty on	104
producers	184
uses	105
Tariff Act of 1930, cited	47, 48, 57, 67, 80, 82, 102, 104
Tehama County	142
Terra cotta	85
Tile	85
Tin	55
Titanium	55
producer	194
Tourmoline	90
Travertine	69
Trinity County	142
Trona	117
Tube mill pebbles	73
Tucker, W. B., photo by	107, 111
Tuff, used for building stone	65
Tulare County	142
Tungsten	56–57
duty on	57
imports	57
producers	195
quotations	56
total production	57
Tuolumne County	143
Turquoise	91
U. S. Bureau of Foreign and Domestic Commerce, cited	36, 46, 50, 57, 110, 115
U. S. Bureau of Mines, cited	19, 25, 38, 41–42, 45, 50, 53–54, 58
Census Bureau, cited	119
Geological Survey, cited	16, 23, 36, 46, 57
Vanadium	57
Ventural County	143
Vitrified brick	61
Volcanic ash	100
producers	176
Well data	24
Witherite	80
Wolframite	57
Wollastonite	83
Yale, Chas. D., cited	42
Yolo County	144
Yuba County	145
Zinc	58
production of United States	58
total production	58
Zircon	108

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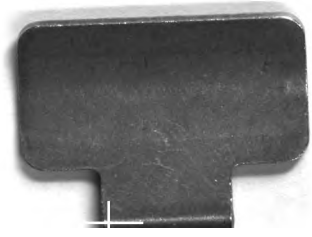

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